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NATIONAL DAM SAFETY PROGRAM. LOWER AETNA LAKE DAM (NJ00418), DE--ETC(U)
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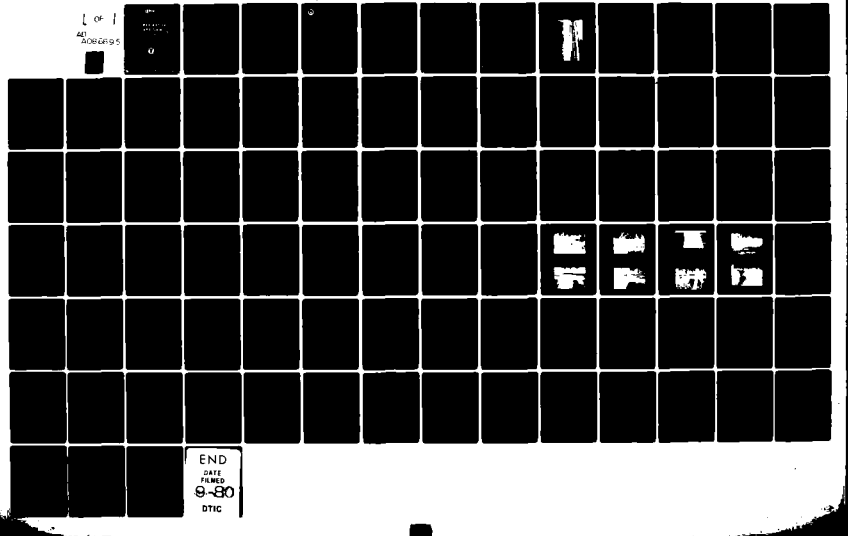

DELAWARE RIVER BASIN
TRIBUTARY TO HAYNES CREEK
BURLINGTON COUNTY,
NEW JERSEY

LOWER AETNA LAKE DAM
NJ 00418

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

DEPARTMENT OF THE ARMY
Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

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MARCH 1980

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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(10) Rudolph Wrubel

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Dam Safety
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National Dam Safety Program
Riprap
Lower Aetna Lake Dam, NJ

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-N

15 JUL 1980

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Lower Aetna Lake Dam in Burlington County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Lower Aetna Lake Dam, initially listed as a high hazard potential structure, but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in fair overall condition. The dam's spillways are considered inadequate because a flow equivalent to five percent of the One Hundred Year Flood would cause the dam to be overtopped. To ensure adequacy of the structure, the following actions, as a minimum, are recommended:

(a) The spillways' adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures and studies within six months from the date of approval of this report. Within three months of the consultant's findings, remedial measures to ensure spillway adequacy should be initiated.

(b) Within six months from the date of approval of this report, the following remedial actions should be initiated:

(1) Embankment areas behind the culvert wingwalls that have been eroded should be regraded and covered with slope protection.

(2) Remove trees on the downstream embankment to lessen the piping potential.

(3) Divert water at the crest of the downstream slope to avoid gullying. Consideration should be given to constructing an extended asphalt lip curb along the rear edge of the pavement to control the run-off.

NAPEN-N
Honorable Brendan T. Byrne

(4) Regrade, compact and seed or sod the various sloughed areas on the backslopes.

(5) Place riprap or energy attenuation material in the downstream main spillway channel to lessen the scouring of the stilling basin and the eventual undercutting of the inverts, especially at Spillway No. 1.

c. The owner should develop an emergency action plan that outlines actions to be taken by the operator in the event of an emergency at the dam and a downstream warning system within six months from the date of approval of this report.

d. The owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam within one year from the date of approval of this report.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Forsythe of the Sixth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Inspection Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Copies furnished:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

LOWER AETNA LAKE DAM (NJ00418)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 12 November 1979 by Louis Berger and Associates Inc. under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Lower Aetna Lake Dam, initially listed as a high hazard potential structure, but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in fair overall condition. The dam's spillways are considered inadequate because a flow equivalent to five percent of the One Hundred Year Flood would cause the dam to be overtopped. To ensure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillways' adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures and studies within six months from the date of approval of this report. Within three months of the consultant's findings, remedial measures to ensure spillway adequacy should be initiated.

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(2) Remove trees on the downstream embankment to lessen the piping potential.

(3) Divert water at the crest of the downstream slope to avoid gullying. Consideration should be given to constructing an extended asphalt lip curb along the rear edge of the pavement to control the run-off.

(4) Regrade, compact and seed or sod the various sloughed areas on the backslopes.

(5) Place riprap or energy attenuation material in the downstream main spillway channel to lessen the scouring of the stilling basin and the eventual undercutting of the inverts, especially at Spillway No. 1.

c. The owner should develop an emergency action plan that outlines actions to be taken by the operator in the event of an emergency at the dam and a downstream warning system within six months from the date of approval of this report.

d. The owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam within one year from the date of approval of this report.

APPROVED: _____
JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: _____

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam: Lower Aetna Lake Dam Fed ID# NJ 00418 and NJ ID# 120 (31-52)

State Located New Jersey
County Located Burlington
Coordinates Lat. 3952.0 - Long. 7448.2
Stream Unnamed Tributary of Haynes Creek
Date of Inspection 12 November 1979

ASSESSMENT OF GENERAL CONDITIONS

Lower Aetna Lake Dam is assessed to be in a fair overall condition, although additional hydraulic studies should be undertaken, in conjunction with all other dams in the area, to determine what improvements can be made to the inadequate spillways. It is recommended that the hazard classification be downgraded to significant as overtopping or collapse would cause only minimal damage to downstream property. Remedial actions to be undertaken in the future include: 1) selective removal of trees on the downstream slopes, 2) regrading and reseeding these slopes and 3) placing riprap in the discharge stilling basins. Consideration could also be given to building a lip curb along the downstream crest shoulder to channelize surface runoff.

The combined capacity of the spillways is inadequate and will accommodate only 4% of the 100 year design flood. Further hydraulic studies are recommended.

Rudolph Wrubel
Vice President
Louis Berger & Associates, Inc.

OVERVIEW OF LOWER AETNA LAKE DAM

December, 1979

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
NAME OF DAM: LOWER AETNA LAKE DAM FED ID# NJ 00418

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

This report is authorized by the Dam Inspection Act, Public Law 92-367, and has been prepared in accordance with Contract FPM-36 between Louis Berger & Associates, Inc. and the State of New Jersey and its Department of Environmental Protection, Division of Water Resources. The State, in turn, is under agreement with the U.S. Army Engineer District, Philadelphia, to have this inspection performed.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the structural and hydraulic condition of the Lower Aetna Lake Dam and appurtenant structures, and to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

Lower Aetna Lake Dam is a 53-year old earth embankment approximately 240 feet long, having two reinforced concrete box culvert/spillway structures flanking a 120 foot concrete bulkhead which supports a series of concrete steps and bleachers for watching swimming events in front of the dam. Spillway No. 1 is located near the right extremity of the embankment while the second spillway is some 60 feet from its left hand limit. A third structure (presently plugged) lies about 100 feet beyond the left end of the embankment and discharges into a separate channel leading to an adjacent small lake. The dam was constructed as a central feature of a large residential development, apparently on the site of a series of earlier water-operated mills. This dam forms only one of a

numerous and nearly continuous sucession of comparable lakes. The lake is also known as Aetna Lake and both names are used hereinafter.

b. Location

Lower Aetna Lake Dam is within the corporate boundary of the Borough of Medford Lakes, Burlington County, New Jersey. It is built across an unnamed tributary to the upper reaches of Haynes Creek which in turn becomes the southwest branch of the Rancocas near the town of Medford. It is located less than 20 miles southeast of Camden, about 3 miles south of both Medford and State Route 70, and is situated just south of secondary State Route 532 (0.2 of a mile from its intersection with Route 541).

c. Size Classfication

The maximum height of the dam is approximately 12 feet and the maximum storage is estimated to be 191.6 acre feet. The dam is therefore placed in the small size category as defined by the Recommended Guidelines for Safety Inspection of Dams (maximum storage less than 1,000 acre-feet and height less than 40 feet).

d. Hazard Classification

Some damage could be inflicted on downstream property in the event of a failure of this dam, however not up to the category of "excessive" according to Corps of Engineers criteria. Based upon field observations, the classification is therefore recommended to be downgraded to significant hazard. The immediate downstream flood plain is mainly open, and the most susceptible development might be one building, a small county bridge, and portions of Tabernacle Road some 100 yards below the dam. An element that could increase the danger appreciably would be the fairly unlikely failure of this and one or more upstream dams is rapid sequence. One recorded instance mentioned only some damage to a road during a 1940 overtopping of the dam and possibly a portion of the lake shore.

e. Ownership

Aetna Lake Dam is owned, operated, and maintained by the Medford Lakes Colony Club Inc., RD#1, Medford, New Jersey.

f. Purpose of the Dam

The dam in its present form has served throughout its existence to contain a lake for recreational and scenic benefits. Earlier versions presumably were used to provide power for a mill waterwheel, although physical traces of such earlier use are not evident.

g. Design and Construction History

Construction of the dam was completed in 1926, although the formal dam application, including plans, was submitted and approved by the state in the following year. The reason for the reversed chronology was recorded as ignorance of the law requiring such application for dams in a tributary watershed of more than 1 square mile and where the stream water level is raised more than 5 feet. The application recounted previous names for the area of Aetna Furnace, Oliphant's Mill, and Ballinger's Mill, the last of these shown on an accompanying plan (that installation was apparently the site of the present dam). Modifications to one of the spillways were proposed in 1960 and again in 1971 but were not approved as submitted, and the present dam exists essentially in its original form. Details of actual construction are not known but the dam was inspected and approved both shortly after its construction and again in response to a complaint following the 1940 flooding. The 25 foot crest was intended as a roadway but is currently limited to maintenance, bicycle, and foot traffic.

h. Normal Operating Procedures

Operation and maintenance of the dam, spillways, and the lake are carried out by a full time staff employed by the owner as a part of their overall duties. Regulation of water level requires manual changes of the flashboards and coordination with operation of upstream and downstream dams.

1.3 PERTINENT DATA

a. Drainage Area

The drainage area of Aetna Lake Dam is 5.99 square miles of gently rolling sandy pine woods with considerable residential development.

b. Discharge of Dam Site

The spillway capacity with the reservoir level at the top of the dam is calculated to be approximately 187 cfs. No discharge records are available.

c. Elevation (above M. S. L.)

Top of Dam - 61.0
Recreation Pool - 57.0
Streambed at Centerline of Dam - 49.0

d. Reservoir
Length of Recreation Pool - 2600 feet
Length of Maximum Pool - 2900 feet

e. Storage

Recreation Pool - 105.6 acre-feet
Top of Dam - 191.6 acre-feet

f. Reservoir Surface
Recreation Pool - 17.6 acres
Top of Dam - 26.3 acres

g. Dam

Type - Earth embankment with three concrete box culvert spillways
Length - 240 feet
Height - 12 feet
Top Width - 25 ± feet
Slopes - Upstream - gentle lake bottom, Downstream - 1:1 or steeper
Zoning - Unknown

h. Diversion and Regulating Tunnel

None

i. Spillways

Type - Concrete arch culverts
No. 1 (Right) 4'x 4.5'
No. 2 (Center) 3.5'x 6'
No. 3 (Left) 2.5 x 2.5' (RCP)
Effective Widths:
No. 1 4.5'
No. 2 4.25'
No. 3 2'

Crest Elevation - 57 m.s.l. (flashboards in place)
Gates- Timber flashboards
U/S Channel - None (main lake reservoir)
D/S Channel
No. 1 & 2 - Natural Streambed
No. 3 - Artificial Channel

j. Regulating Outlets - None

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

The design information available for review was limited to two drawings submitted with the 1927 application for approval of the dam. The drawings were prepared by C. Edgar Haines, P.E., of Vincentown, N.J. and provide a clear idea of the overall plan of the dam but little detail. Partial dimensions are included for only one of the three spillway structures. No design computations, structural analyses, or other technical data were found and most of the dimensions contained herein are field measurments.

2.2 CONSTRUCTION

No information was obtained regarding the actual construction and the plans noted above indicate a sand embankment with approximate 1:1 turf covered slopes, and the reinforced concrete structures. No undue settlement is indicated and the 50 year old embankment is assumed to be reasonably well compacted. Foundation soils of this vicinity are recent alluvium composed of sand, silt, some clay and surficial organic matter over deeper lying sand formations. The lake is situated along an undulating interstream divide characteristic of the central part of Burlington County and lies within a narrow strip of land covered with recent alluvium of mainly silt and sand, with some clay and significant amounts of organic matter near the surface. Underlying the alluvium, and existing as surficial soil beyond the stream divide, is the Kirkwood Sand formation, a fine micaceous quartz sand with interbedded silty sand layers. Drainage conditions within the immediate area are poor but improve to good to excellent just beyond the stream divide. Depth to bedrock is greater than 100 feet.

2.3 OPERATION

With no construction modification attendant, the present structure is considered to be essentially as shown on the original drawings. Maintenance of embankment and spillways and flashboard adjustments are performed by responsible personnel.

2.4 EVALUATION

a. Availability

Sufficient engineering data is available for a rational assessment of a dam of this size and hazard classification.

b. Adequacy

Original engineering data indicates a correct and conservative design of embankment and spillways. Field inspection confirms that it was built in accordance with the plans. Although details are lacking for construction of both embankment and concrete structures, the plans are adequate for engineering assessment purposes.

c. Validity

Validity of the 1927 design plans is not questioned but further investigations would be required to determine long term embankment stability, especially if the downstream slope erosion is allowed to continue. However, based on the assumption that the corrective measures set forth in Section 7 are undertaken, further structural investigations are not recommended to validate the small amount of engineering information available.

SECTION 3 - VISUAL INSPECTION

a. General

Visual inspection of Lower Aetna Lake Dam was conducted on 12 November 1979. Water level at that time was a few inches above the timber flashboards and flowing freely through two of the three spillways. Flashboards were in good condition, the top planks being new, and obviously in regular use. The third spillway appeared unused and serves only to equalize water levels between this and Birchwood Lake. The surface of the roadway forming the crest of the dam was of gravel and badly deteriorated macadam but is fairly even in profile.

b. Dam

In general, the dam was found to be in an old but reasonably stable condition. The reservoir water level appears to be maintained at a fairly constant level except for periods of heavy rain or cleaning of the lake bed. In normal times, the outflow is fairly uniform. A major part of the upstream face is protected by a combination of a concrete bulkhead and the concrete walls into which the spillways are set. Slopes beyond them have been modified by the placing of sand for a bathing beach and probably by some sedimentation to a low enough angle to offer no problems. Downstream slopes, on the other hand, exhibit a variety of problems in spite of some maintenance effort. With no runoff protection along the roadway, gullies were noted along the entire top of downstream slope. Most are small but they become more severe between the outlet of culverts no. 1 & 2. Original 1:1 slopes have been oversteepened in many places by erosion including some sloughing and undercutting. Soil and even riprap and bituminous slope protection have been removed from behind the the No. 2 culvert wingwalls. Seepage was noted near the base of a tree near the left end of the embankment. A combination of noncohesive soils and activity of the children of the community makes maintenance of such steep slopes difficult. Slight leaning of poles and guardrails also indicate movement on the downstream side of the embankment. The entire crest is protected with an old, weathered asphalt surface but is fairly regular in elevation in spite of its deteriorated condition. Much of the crest appears to be at a slightly

higher elevation than that of the surrounding terrain, such that overtopping would flow around the sides of the dam before cresting the embankment proper.

c. Appurtenant Structures

The upstream concrete bulkhead is in true horizontal and vertical alignment and the concrete is in good condition with only minor and infrequent cracking and spalling. Junctions with the embankment are generally good. The concrete spillway structures are likewise in satisfactory alignment and condition. The culverts and their downstream wingwalls also display only minor spalling, but effects of embankment slope problems are again evident in the walls of culvert #1 being tilted approximately 4 inches out of plumb. As noted earlier, culvert #3 is heavily silted and can transmit little active flow. Culvert #1 has three steps from the floor of the intake structure varying from 3.5' to 4' to 6' in height by 4.5' wide, while culvert no. 2 is a uniform 3.7' by 6.2' in section. All heights are at the center of a slight arch. There are no other auxiliary spillways unless parts of the lake shore may serve such purpose as suggested in the original application. This could not be determined without precise leveling surveys.

d. Reservoir Area

Lower Aetna Lake has a stable, well-defined shoreline emphasized by the numerous bulkheads and docks fronting most of the lakeside homes. Some silting of the lake has occurred during its lifetime and periodic cleaning of the bottom, at least near the shore line has been performed. Although only a few feet above normal lake levels, flooding of homes has apparently been very rare.

e. Downstream Channel

The bed of this unnamed stream, (although identified in the 1927 application as Sharps Branch) curves gently through a wooded park-like flood plain that averages about 200 feet wide before flowing into the next lake a half mile below the dam. The downstream flood plain is part of the E. Earle Jackson Memorial Park and has been landscaped and maintained as such.

The bridge at Tabernacle Road and building a short distance from the dam show no signs of any recent effects of high water. Water and channel were clear at the time of inspection. However, it was noted that Tabernacle Road is several feet below the dam crest.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

No specific procedures were observed by the inspection team, but maintenance staff members provided verbal descriptions of their duties concerning the dam. Condition of the active spillways and flashboards was good, and they are obviously kept in effective working order.

4.2 MAINTENANCE OF DAM

The Colony Club personnel are responsible for general maintenance of the embankment and appurtenant structures. No recent repair of the culverts has been accomplished and the main activity regarding the embankment seems to be continuing efforts to stabilize the erosion problems of the downstream slope. The roadway pavement is in poor condition (it carries little vehicular traffic) but discharges all the surface flow on the side slopes.

4.3 MAINTENANCE OF OPERATING FACILITIES

These facilities are limited to the three simple spillways. All appear sound, and the two located in the embankment are clear and functional. The third one shows neglect and serves only a limited purpose.

4.4 DESCRIPTION OF WARNING SYSTEM IN EFFECT

No formal system exists, but communication with other upstream and downstream owners is reportedly undertaken during storms or other special cases. The full time personnel are able to keep a close check on their own lakes, and most of those responsible for other lakes cooperate in their joint efforts and responsibilities.

4.5 EVALUATION OF OPERATIONAL ADEQUACY

Given the limits in the capacity of the spillways and culverts, and the informality but effective employment of the warning system, the procedures are deemed adequate in view of the lack of intensive development immediately downstream. Much depends on direct human effort and its coordination, and Aetna Lake Dam enjoys a distinct advantage in having full time staff people available.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data

In accordance with the criteria in the Recommended Guidelines for Safety Inspection of Dams, it has been determined that the dam at Lower Aetna Lake is small in size and significant hazard. Acordingly, a 100-year frequency event was selected as the design storm and an inflow hydrograph was calculated using precipitation data from Tehnical Paper 40 and NOAA Technical Memorandum NWS Hydro-35.

The routed outflows from Upper Stokes, Lake Stockwell, and Upper Aetna Lake dams were included in the inflow to Aetna Lake as these dams lie immediately upstream and lie within the overall drainage basin of Aetna Lake. Inflow also included that due to the intermediate drainage area between Upper and Lower Aetna Lakes.

The inflow to the reservoir for the selected 100-year storm was computed utilizing the HEC-1 computer program. This gave a peak inflow to the reservoir of 5311 cfs which when routed, was reduced to 5205 cfs. The combined spillways have a maximum discharge capacity of approximately 187 cfs before overtopping occurs and thus can accommodate only 4% of the design flood and is therefore inadequate.

b. Experience Data

No meaningful original design data was available for review. Records do indicate, however, that the dam was overtopped in September, 1940. This overtopping caused little damage to the embankment and downstream environs.

c. Visual Observations

There is little that can be done to appreciably increase the discharge capacity of the present spillways without major reconstruction. At the time of inspection the water level in the lake was approximately 1 foot below normal pool elevation. The lake had been lowered to facilitate maintenance of lakeside docks.

d. Overtopping Potential

Based on the results of the hydraulic analysis, the capacity of the spillways is inadequate to accommodate the Standard Design Flood (SDF) and thus, the potential remains substantial. There is, however, only one recorded incident of overtopping (September, 1940). A reasonable depth of overtopping above 2 feet cannot be foreseen because at that elevation, the water would inundate large portions of the surrounding community and further rising of the flood would not be expected.

e. Drawdown

At the present time complete drawdown is not easily accomplished as there is no practical method of removing all the stoplogs. However, in an emergency with the planking removed by force, the lake would take approximately one half day to drawdown from normal pool (El. 57) to the base of the stoplogs (El. 51.3).

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

Based upon the existing conditions inspected in the field and review of the one set of original design plans, the dam is judged to be in relatively sound structural condition except for erosion on the downstream slope. The ratio of embankment width to height is favorable to its stability, and concrete spillway and culvert structures appear to be satisfactory in quality and attitude after the 50 years of service. In addition to the erosion, which affects the entire backslope to varying degrees from crest to toe, one instance of seepage was observed that is probably related to the root system of a tree. More serious questions involve the very restricted total discharge capacity and its relationship to potential stress on the dam. A related question might be whether overtopping of any part of the lake is intended to bypass the dam itself as noted in the 1927 letter of application. No clearly defined auxiliary spillway exists.

b. Design and Construction Data

Although no design computations were available, the comparatively small concrete structures exhibit only minor cracking and spalling. These structures and embankment show no evidence of differential settlement problems.

c. Operating Records

No records are available but the dam appears to be operating satisfactorily. The only recorded instance of overtopping occurred almost 40 years ago, and a subsequent inspection of the dam disclosed no significant damage.

d. Post Construction Changes

There have been none beyond routine maintenance of embankment slopes and replacement of flashboards. Earlier proposed spillway changes were not accomplished as the owners did not succeed in obtaining State approval.

e. Seismic Stability

Lower Aetna Lake Dam is located in Seismic Zone 1 and due to embankment width versus lesser height has negligible potential earthquake vulnerability. Depth to bedrock is over 100 feet. Experience indicates that Zone 1 dams with adequate stability under static loads will satisfactorily resist dynamic loadings.

SECTION 7 - ASSESSMENTS/RECOMMENDATIONS/ PROPOSED REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Subject to the inherent limitations of the Phase I visual inspection, Lower Aetna Lake Dam is classified as being in fair overall structural condition although the spillways are incapable of passing the design flood. The dam embankment was built of unknown specific composition, but due to its width to height ratio is believed to be sufficiently impervious to withstand normal hydraulic heads. The present spillway capacity does not meet the requirements of the Recommended Guidelines for Safety Inspection of Dams, being able to accommodate only 4% of the design flood as calculated by Corps of Engineers criteria. The calculated SDF would overtop the dam by 4 feet causing damage primarily to the downstream face. It is noted that the theoretical overtopping height is very conservative in that the surrounding terrain is so flat that the higher elevations of overflow would be substantially relieved by discharge into the adjacent level areas which would diminish any further rise. Thus, the overall condition would not increase the danger to human life. A suitable increase in spillway capacity would require major reconstruction effort.

b. Adequacy of Information

The information gathered for the Phase I inspection is deemed to be adequate regarding the structural stability of the dam. However, no recent survey or inspections have been made since 1971 when Division of Water Policy engineers inspected the dam. The full content of their report is unkown.

c. Urqency

It is recommended that the remedial measures enumerated below be taken under advisement in the future.

d. Necessity for Further Study

Due to the hazard classification and the fact that this dam is the lowest member of a near continuous

chain of at least ten dams, further hydraulic studies are recommended, taking into account the entire reach of the stream system and the hydraulic interface between dams.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

a. Recommendations

On the basis of this visual inspection, improvements to the present spillways should be held in abeyance until further studies are made. In addition to increasing spillway capacity, some thought should be given to the development of auxiliary facilities. Additionally, embankment areas behind the culvert wingwalls that have been eroded should be regraded and covered with slope protection.

Other remedial measures to be taken under advisement include:

1. Selective removal of trees and dead root systems on the downstream embankment to lessen piping potential.

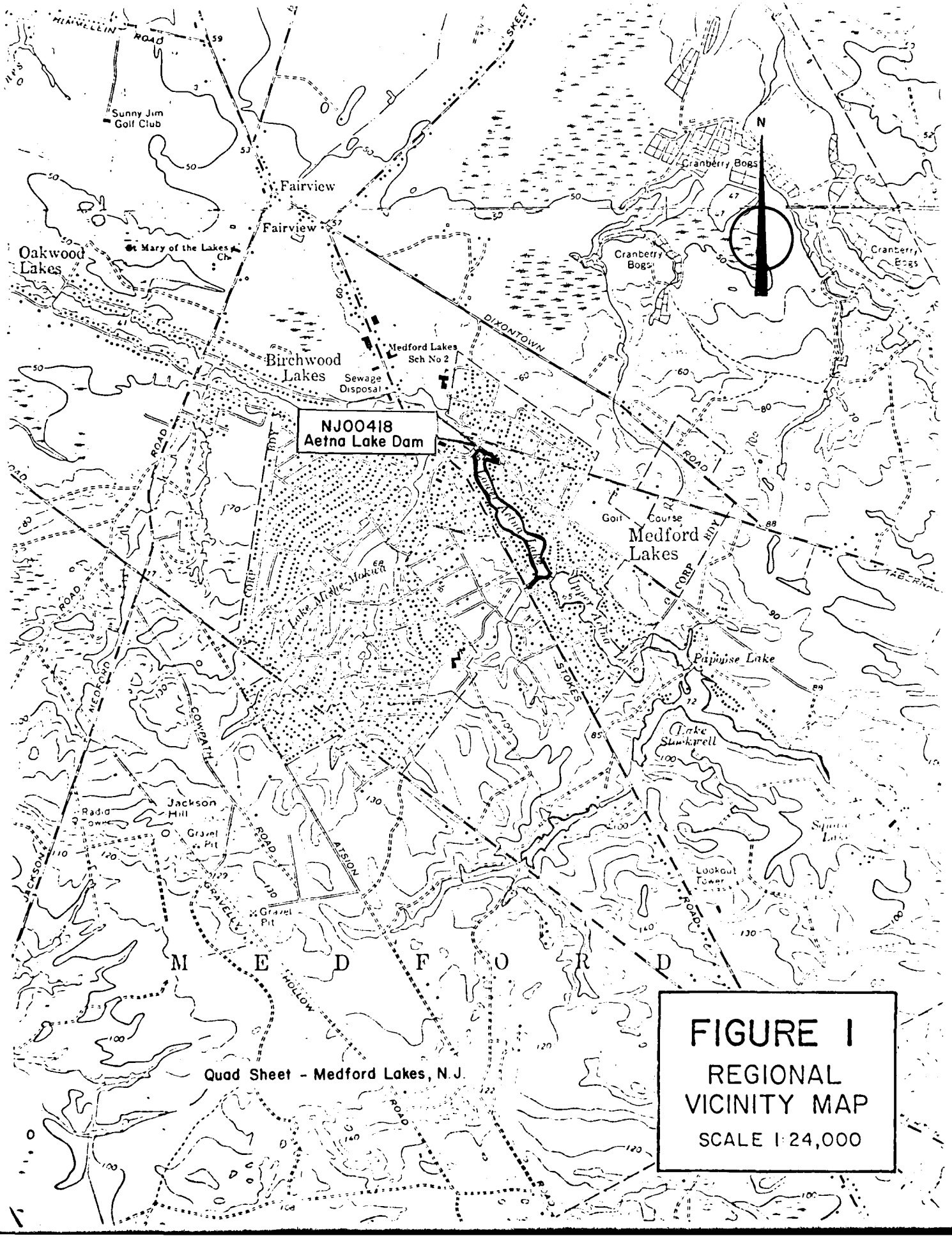
2. Diversion of water at the crest of the downstream slope to avoid gullying. Consideration should be given to constructing an extended asphalt lip curb along the rear edge of the pavement to control the run-off.

3. Regrading, compacting, and seeding or sodding the various sloughed areas on the backslopes.

4. Placing riprap or energy attenuation material in the downstream main spillway channel to lessen the scouring of the stilling basin and the eventual undercutting of the inverts, (especially at Spillway No. 1).

b. O&M Maintenance and Procedures

In the near future, the owner should develop written operating procedures and a periodic maintenance plan to insure the safety of the dam. Also, communication with all of the owners of the lakes involved should continue regarding any sudden changes in their discharge.


NJ00418
Aetna Lake Dam
Quad Sheet - Medford Lakes, N.J.
FIGURE 1
REGIONAL
VICINITY MAP
SCALE 1:24,000
N
Sunny Jim Golf Club
Fairview
Oakwood Lakes
St Mary of the Lakes Ch
Birchwood Lakes
Medford Lakes Sch No 2
Sewage Disposal
Cranberry Bogs
DIXONTOWN
Golf Course
Medford Lakes
Lake Mirror-Makwa
Upper Aetna Lake
Papoose Lake
Lake Stinkwell
Jackson Hill
Radio Tower
Gravel Pit
Lookout Tower
M E D F O R D

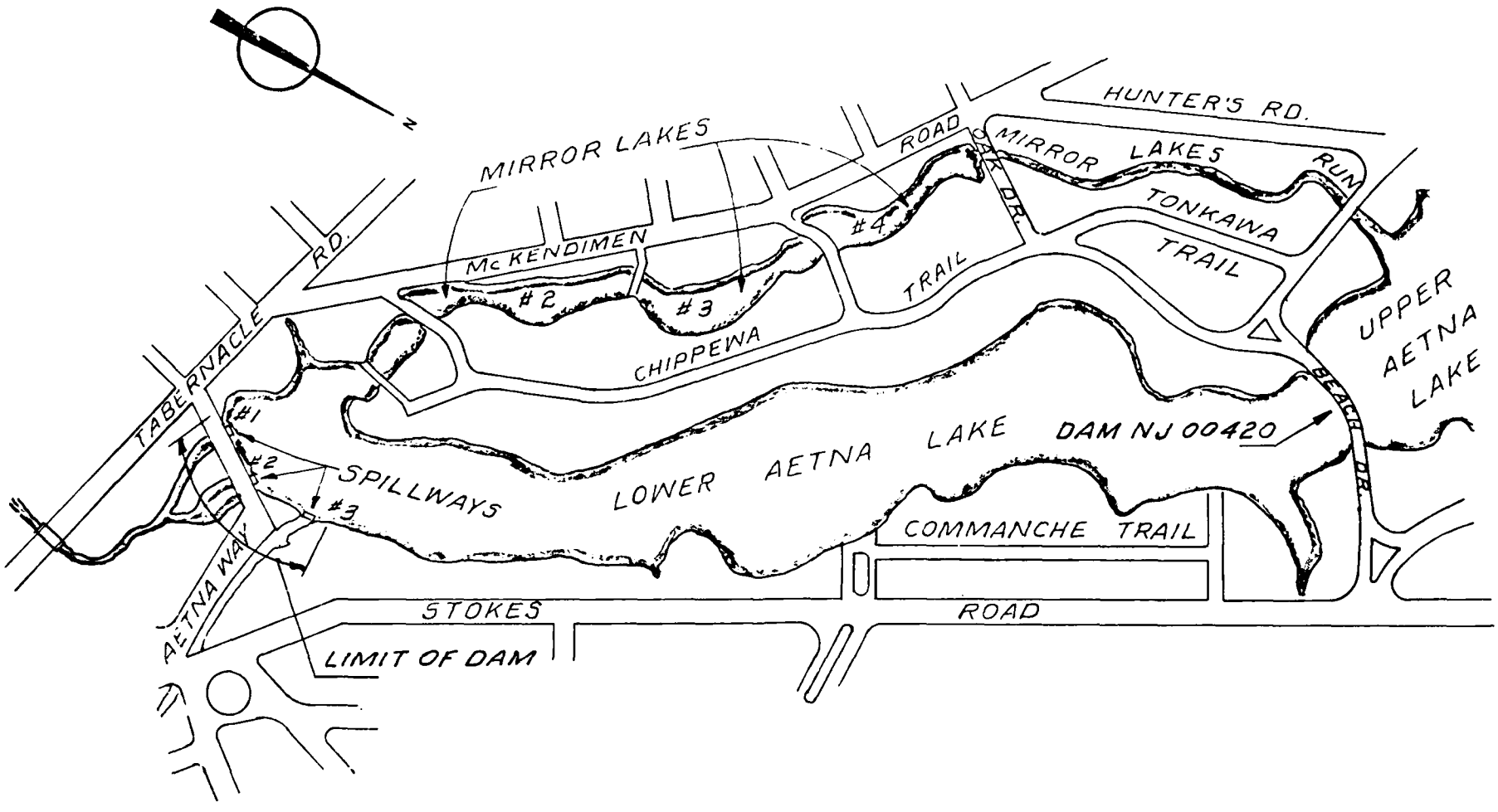
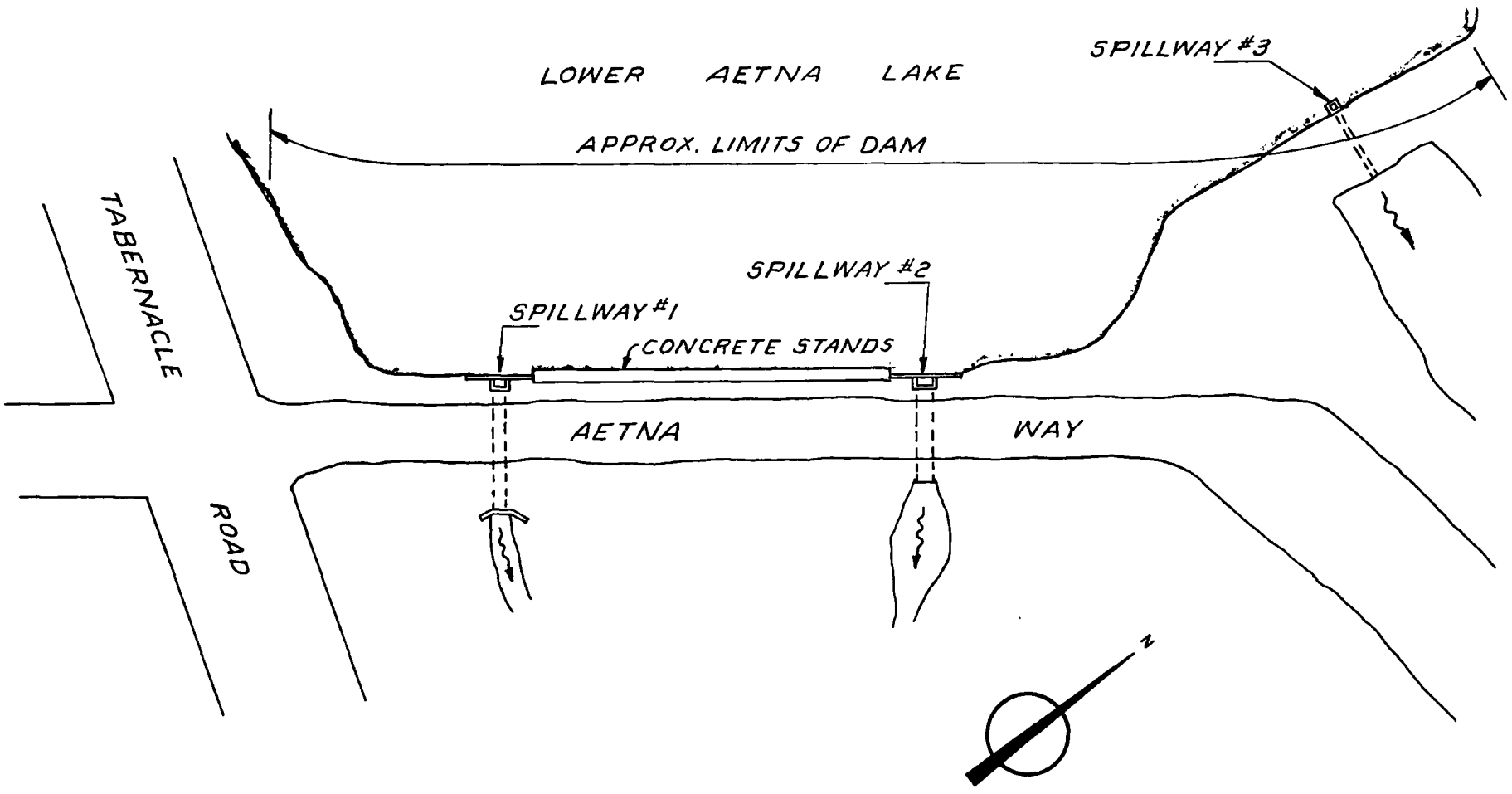


FIGURE 2

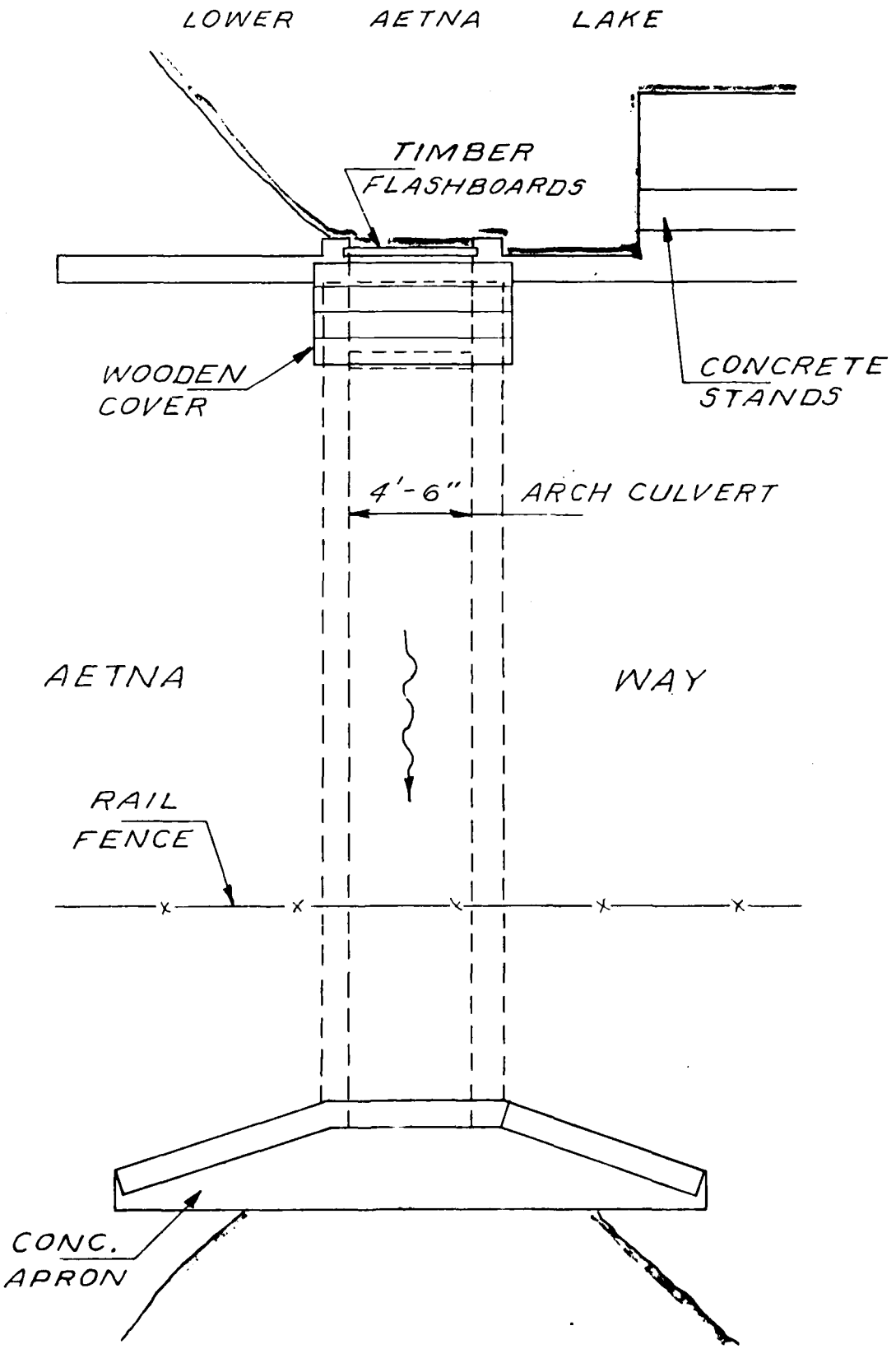
LOCATION PLAN
NOT TO SCALE



PLAN

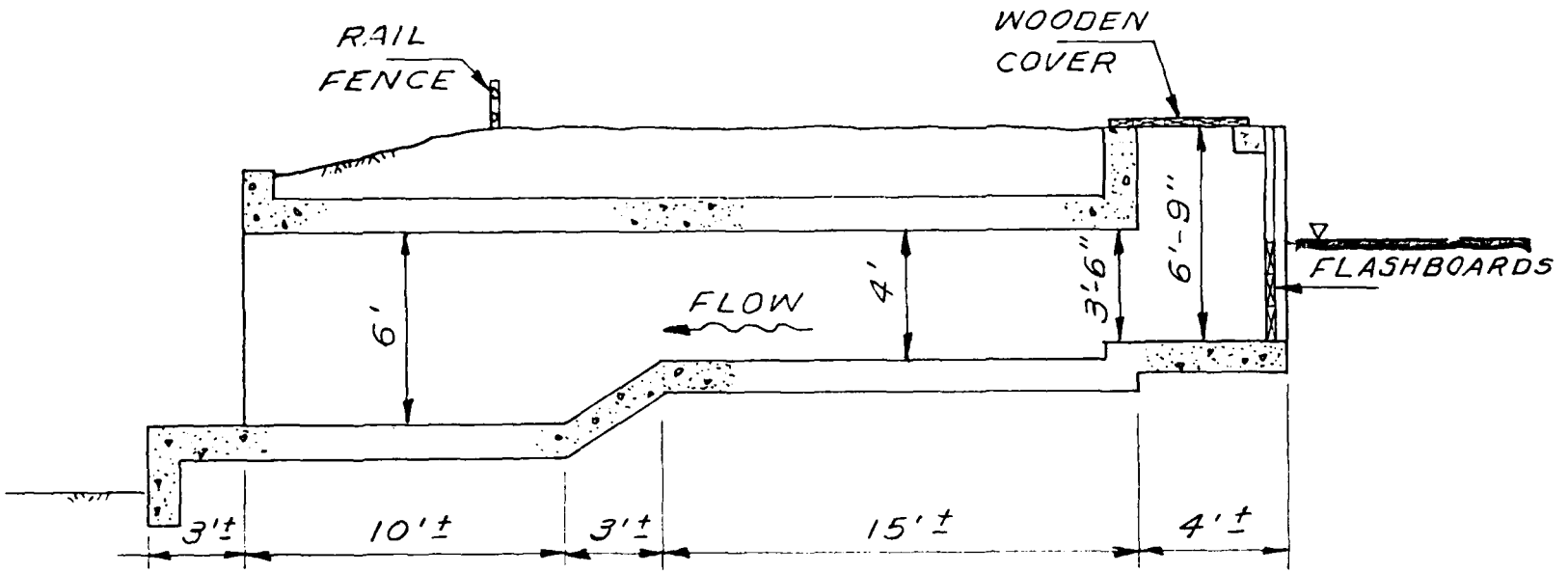
NOT TO SCALE

FIGURE 3

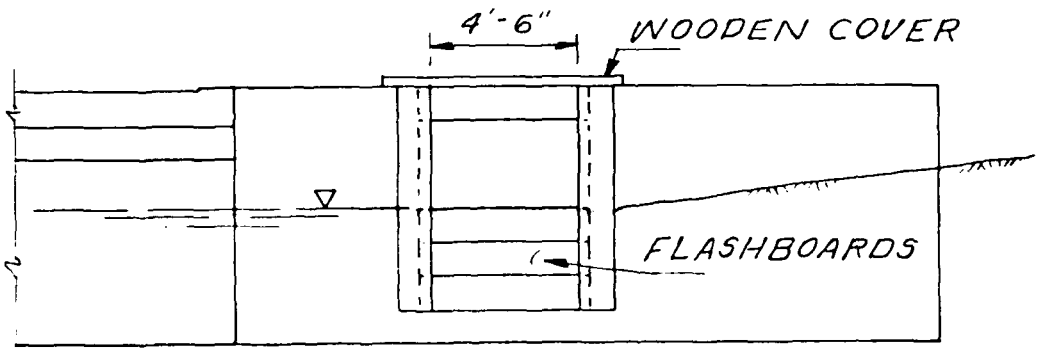


PLAN - SPILLWAY NO. 1
NOT TO SCALE

FIGURE 4



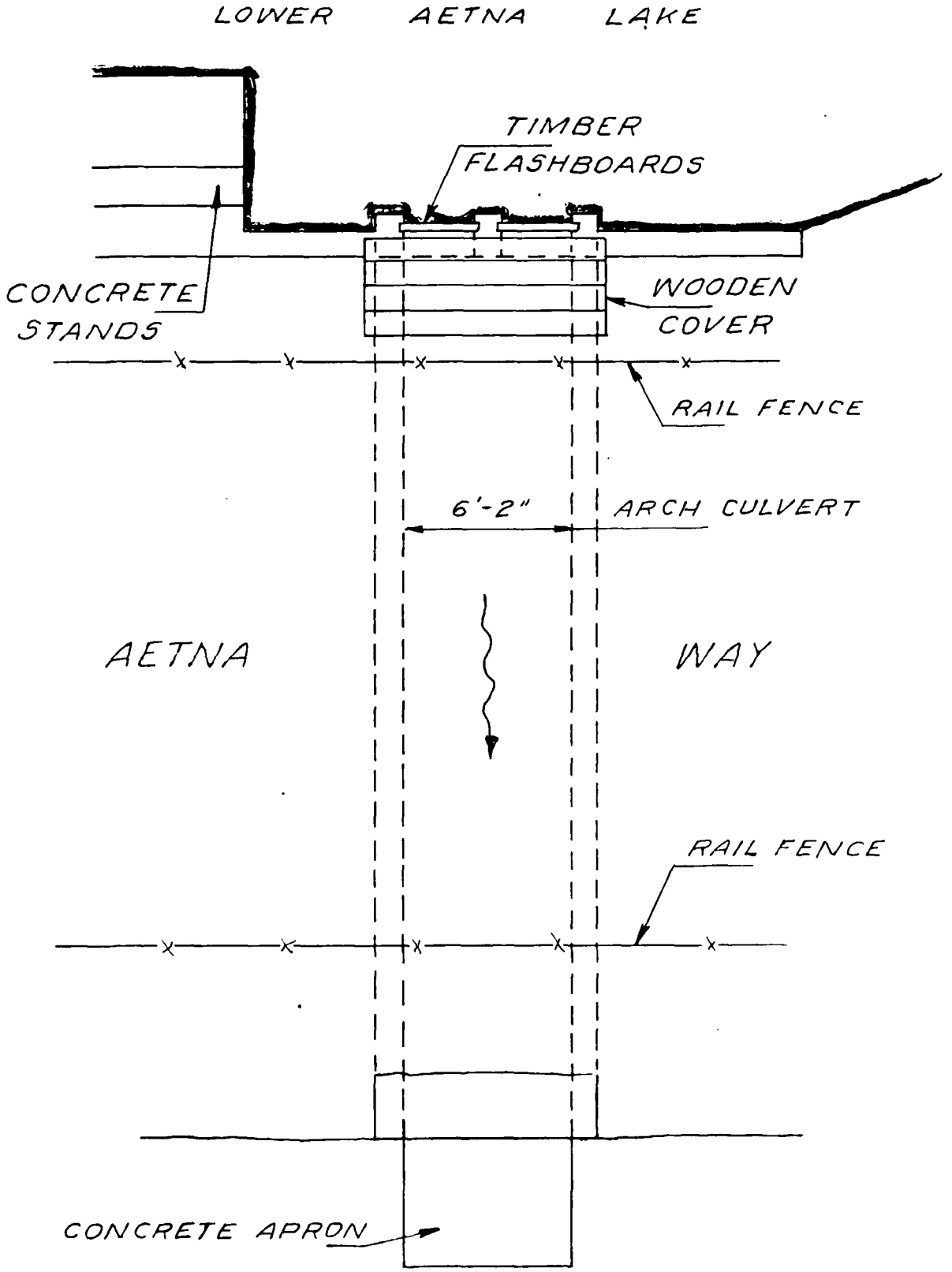
SECTION THRU SPILLWAY



INLET ELEVATION

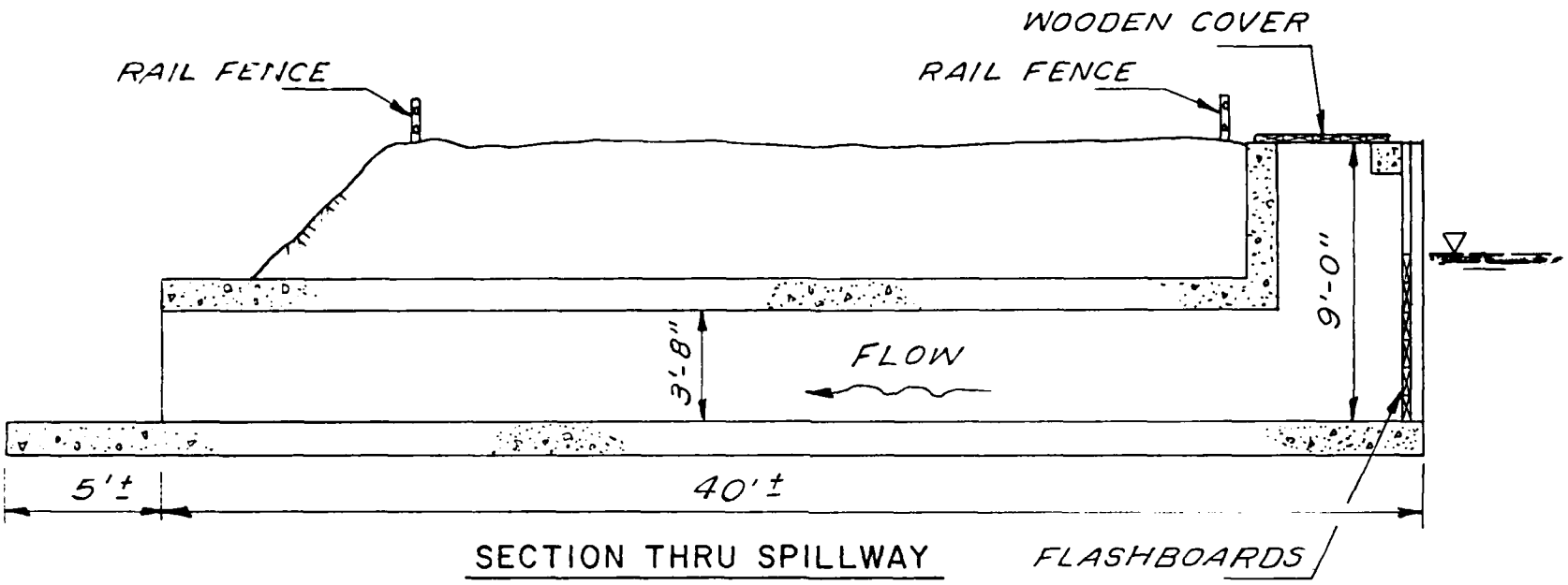
SPILLWAY NO. 1

FIGURE 5

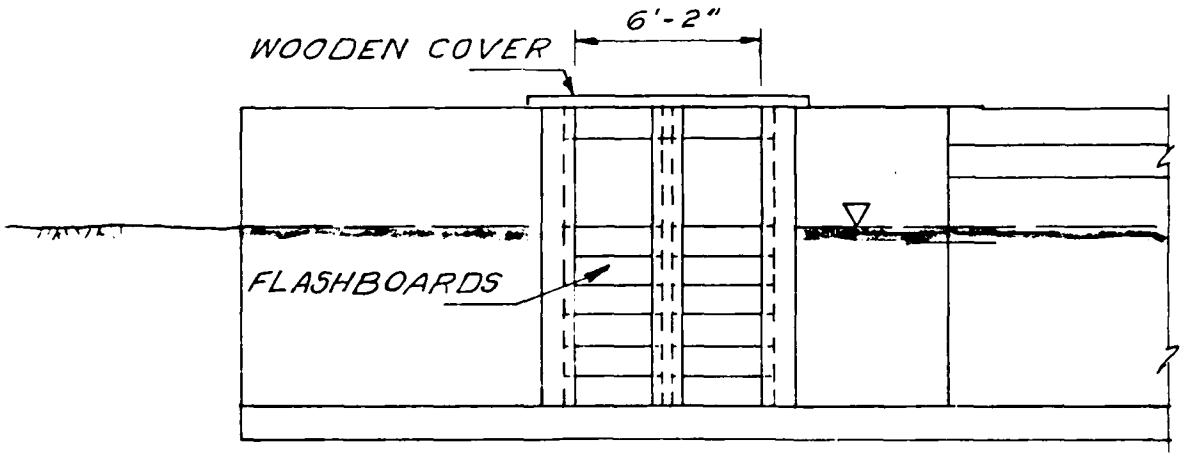


PLAN-SPILLWAY NO. 2
NOT TO SCALE

FIGURE 6



SECTION THRU SPILLWAY



INLET ELEVATION

SPILLWAY NO. 2

FIGURE 7

Check List
Visual Inspection
Phase 1

Name Dam Aetna Lake County Burlington State New Jersey Coordinators NJDEP

Date(s) Inspection 11-12-79, 12-24-79 Weather Cloudy Temperature 50°

Pool Elevation at Time of Inspection 57.5 M.S.L. Tailwater at Time of Inspection 49.2 M.S.L.

Inspection Personnel:

L. Baines, E. Simone
J. Voorhees, K. Jolls
D. Lang

D. Lang Recorder

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SEE PAGE ON LEAKAGE		
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	120' concrete bulkhead with bleachers. Junction at embankment is good. 2 - timber docks approximately 40' long extend into lake.	
DRAINS	none observed	
WATER PASSAGES	none through bulkhead	
FOUNDATION	unknown	

EMBANKMENT

VISUAL EXAMINATION OF	OBERSVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	minor cracking and spalling near south end of bulkhead	
STRUCTURAL CRACKING	minor cracks at vertical joints	
VERTICAL AND HORIZONTAL ALIGNMENT	bulkhead in true alignment, overall condition of concrete in good shape.	
MONOLITH JOINTS	satisfactory	
CONSTRUCTION JOINTS	good	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	Top embankment serves as a roadway and is surfaced with a variety of materials i.e. asphalt, gravel, sand etc... no major cracks seen, embankment top width approx. 23' ±	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	Sloghing and undercutting occurring near toe around culvert No. 2	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Crest erosion along entire length, particularly severe between culverts No. 1 and No.2. Slopes vary from 1H: IV to near vertical. Some undermining and undercutting found behind headwall of culvert No.2.Frosion at south end due in part to pedestrian traffic.	
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	Fair condition, roadway surface uneven in some places mainly attributed to surface runoff erosion.	
RIPRAP FAILURES	Rip rap failures behind No.2 box culvert headwalls, evidence of asphalt slope protection but almost all has washed away.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	fair - roadway embankment	
ANY NOTICEABLE SEEPAGE	free flowing seepage just south of No. 2 culvert coming through along root system of tree embankment. standing water at toe between culverts No. 1 and No. 2 could be seepage or remains of recent rainfall.	
STAFF GAGE AND RECORDER	none	
DRAINS	none	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	minor spalling of culvert No.2 d/s slab	
INTAKE STRUCTURE	concrete culverts with timber flash-boards.	Condition satisfactory.
OUTLET STRUCTURE	concrete culverts with headwalls for No.1 and No.2 30" Ø RCP for No.3 (heavily silted and partially plugged).	
OUTLET CHANNEL	meandering natural channel small pool below No.2	
EMERGENCY GATE	none	

UNGATED SPILLWAY N/A

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	N/A	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE AND PIERS	N/A	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL		
APPROACH CHANNEL	Lower Aetna Lake main reservoir	
DISCHARGE CHANNEL	(see downstream channel sect.)	
BRIDGE AND PIERS	none	
GATES AND OPERATION EQUIPMENT	hand removed timber flashboards	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	none	
OBSERVATION WELLS	none	
WEIRS	none	
PIEZOMETERS	none	
OTHER		

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	gentle near dam, beach and bathing area at north end of dam rising more steeply at south end, most homes along lake have constructed bulkheads.	
SEDIMENTATION	slight at south end near culvert No. 3	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	County bridge approximately 100 yds. downstream (slightly restricted hydraulic opening)	
SLOPES	gentle, flat flood plain for culverts No.1 and No.2 culvert No.3 drains into roadway ditch 4-5' wide. Dowstream area is E. Earle Jackson Town Park; roughly graded and landscaped.	
APPROXIMATE NO. OF HOMES AND POPULATION	numerous commercial buildings about 8' above channel - all below Tabernacle Road crossing and above flood line.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	Available - 1927 reconstruction NJDEP Division of Water Resources - Bureau of Flood Plain Management: Trenton, New Jersey.
REGIONAL VICINITY MAP	Available - USGS Quad - Medford Lakes, N.J.
CONSTRUCTION HISTORY	Available - NJDEP
TYPICAL SECTIONS OF DAM	None available
HYDROLOGIC/HYDRAULIC DATA	Some available, however information was primarily for unapproved spillway reconstruction design - NJDEP
OUTLETS - PLAN	Not available
- DETAILS	" "
-CONSTRAINTS	" "
-DISCHARGE RATINGS	" "
RAINFALL/RESERVOIR RECORDS	None available

ITEM	REMARKS
SPILLWAY PLAN	Not available
SECTIONS	" "
DETAILS	" "
OPERATING EQUIPMENT PLANS & DETAILS	None available

ITEM	REMARKS
DESIGN REPORTS	None available
GEOLOGY REPORTS	" "
DESIGN COMPUTATIONS	None Available
HYDROLOGY & HYDRAULICS	" "
DAM STABILITY	" "
SEEPAGE STUDIES	" "
MATERIALS INVESTIGATIONS	None available
BORING RECORDS	" "
LABORATORY	" "
FIELD	" "
POST-CONSTRUCTION SURVEYS OF DAM	None available
BORROW SOURCES	Unknown

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	None
HIGH POOL RECORDS	None available
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Records of application for reconstruction of spillway #2 available
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION - not available REPORTS - not available	None known
MAINTENANCE OPERATION RECORDS	none available none available none available

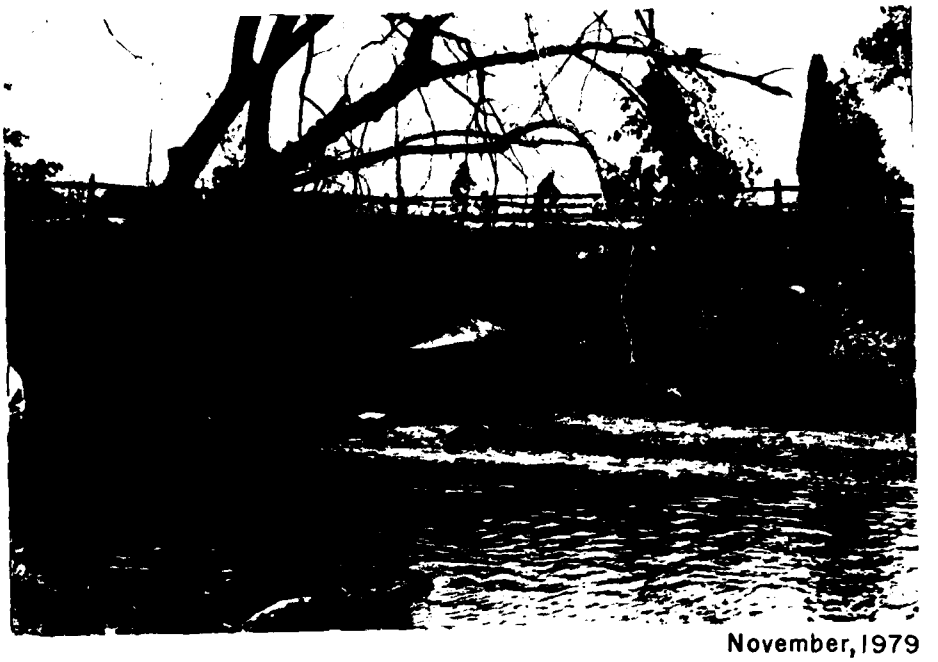
November, 1979

View of Outlet

SPILLWAY No. 1

November, 1979

View of Inlet



November, 1979

View of Outlet

SPILLWAY No. 2

November, 1979

View of Inlet

December, 1979

View of Inlet

SPILLWAY NO. 3

November, 1979

View of Outlet

November, 1979
View of Downstream Embankment

November, 1979
View of Downstream Embankment
to the left of Spillway #1

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 5.99 square mile

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 57 M.S.L. (105.6 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 61 M.S.L. (191.6 acre feet)

ELEVATION MAXIMUM DESIGN POOL:

ELEVATION TOP DAM: 61 M.S.L.

CREST:

a. Elevation 61 M.S.L.
b. Type Earth embankment with three concrete box culvert spillways
c. Width 25± feet
d. Length 240 feet
e. Location Spillover #1 @ right abutment #2 @ 60' from left abut
f. Number and Type of Gates

OUTLET WORKS: main spillway

a. Type 2 - celled concrete box culvert
b. Location 60' from left abutment
c. Entrance inverts 57 M.S.L.
d. Exit inverts 49 M.S.L.
e. Emergency draindown facilities timber flashboards

HYDROMETEOROLOGICAL GAGES: None

a. Type
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE: 187 cfs

BY L.P. DATE 12-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A1 OF

CHKD. BY J.S. DATE 12-79 LOWER AFTON LAKE DAM PROJECT C-246

SUBJECT

Time of concentration

California Culverts Practice

Length along longest watercourse = .83 mile = 4,400 feet

$\Delta H = 130 - 57 = 73$ feet

$$t_c = \left(\frac{11.9L^3}{H}\right)^{0.385} = \left(\frac{11.9(.83)^3}{73}\right)^{0.385}$$

$t_c = 0.401$ hrs

Alternate method

Assume velocity = 2.0 ft-sec^{-1}

$$\therefore t = \frac{2400 \text{ ft}}{2 \text{ ft-sec}^{-1} \times 3600 \frac{\text{sec}}{\text{hr}}} = .333 \text{ hr}$$

Overland flow $\Delta H = 130 - 70 = 60$

$$\text{Slope} = \frac{60 \times 100}{2000} = 3\%$$

Assume velocity = 2 ft-sec^{-1}

$$\therefore t' = \frac{200}{2 \times 3600} = 0.28 \text{ hr}$$

Total = .333 + .28 = .611 hrs

BY L.B. DATE 3-80 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A2 OF

CHKD. BY DATE LOWER ARTIA LAKE DAM PROJECT C246

SUBJECT

USE $t_c = 0.51$ HRS

$T_p = D/2 + 0.6\,t_c$

$= \frac{0.25}{2} + 0.6(0.51)$

$= 0.431$ HRS

INTERMEDIATE D.A. = 0.48 mi^2

$Q_p = \frac{484\,(D.A.)}{T_p}$

$= \frac{484(0.48)}{0.431}$

$= 539$ CFS

UNIT GRAPH

TIME (HRS)	T/T_p	DIMENSIONLESS ORDINATE (D.O.)	Q (CFS) = Q × D.O.
0.25	0.58	0.564	304
0.50	1.16	0.946	510
0.75	1.74	0.454	245
1.00	2.32	0.202	109
1.25	2.90	0.085	46
1.50	3.48	0.037	20
1.75	4.06	0.0174	9
		Σ =	1243 CFS

CHECK: 1243 ft³/sec × 3600 sec/hr × 1 mi²/5280² ft² × 1/.48 mi² × $\frac{1\text{ hr}}{4}$ × 1"

= 1.00 "

BY J.C. DATE 12-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A3 OF

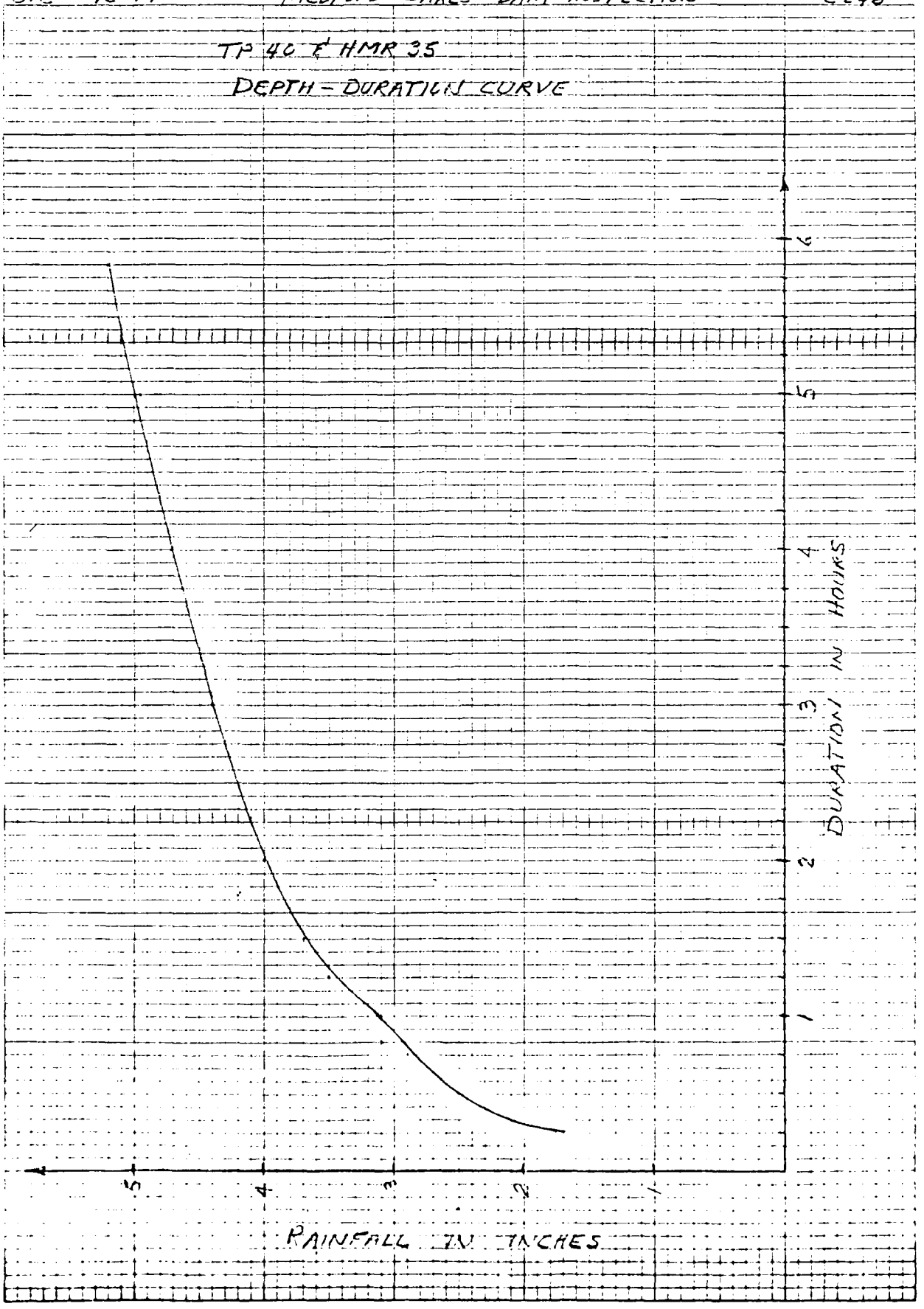
CHKD. BY DATE MEDFORD LAKES DAM INSPECTION PROJECT C246

SUBJECT DEPTH - DURATION RAINFALL DATA FROM TP 40 & HMR 35

100 YR FREQUENCY

TIME	PRECIPITATION	Δ	REARRANGE
0.25	1.7	1.7	0.06
0.50	2.4	0.7	0.06
0.75	2.8	0.4	0.06
1.00	3.1	0.3	0.06
1.25	3.5	0.4	0.07
1.50	3.7	0.2	0.07
1.75	3.86	0.16	0.08
2.00	4.00	0.14	0.09
2.25	4.11	0.11	0.09
2.50	4.22	0.11	0.09
2.75	4.31	0.09	0.11
3.00	4.40	0.09	0.11
3.25	4.49	0.09	0.30
3.50	4.57	0.05	0.70
3.75	4.64	0.07	1.70
4.00	4.71	0.07	0.40
4.25	4.78	0.07	0.40
4.50	4.84	0.06	0.20
4.75	4.90	0.06	0.16
5.00	4.96	0.06	0.14
5.25	5.02	0.06	0.07
5.50	5.08	0.06	0.06
5.75	5.14	0.06	0.06
6.00	5.20	0.06	0.06

J.C. 12-79 MEDFORD LAKES DAM INSPECTION C246

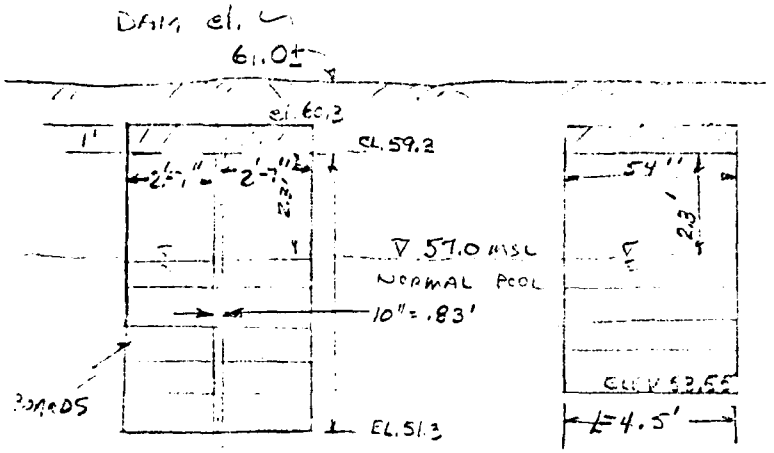


BY J.C. DATE 12/18/79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A5 OF

CHKD. BY DATE LOWER AETNA LAKE DAM PROJECT C246

SUBJECT SPILLWAY CALCULATIONS

OUTLET # 2 OUTLET # 1 NOTE: OUTLET 3 appears to be a leveling culv. (18") with negligible effect on outlet flow since it is clogged FLOW OVER DAM



SPILLWAY DISCHARGE

EL. 59.2 to 61 SHARP CRESTED WEIR	ENTRANCE, SHARP CREST. WEIR
$Q = CLH^{3/2}$ where $L = 5.4'$	$Q = CLH^{3/2}$ where $L = 54" = 4.5'$
$C = 3.2$ KING'S HNDBK HYD PG 5-14 FIG 5-3	$C = 3.3$ KING'S
WEIR BETWEEN 57 & 59.2	WEIR BETWEEN 57 & 59.3
ORIFICE BETWEEN ELEV 59.2 – 61	ORIFICE BETWEEN ELEV 59.3
$Q = CA\sqrt{2gh}$	$Q = CA\sqrt{2gh}$
$C = .62$ $A = 5.4 \times 2.3 = 12.4^{SF}$	$C = .62$ $A = 2.3 \times 4.5 = 10.4^{SF}$
(KING 7-26 E4-4)	

WEIR FLOW OVER ELEV 61.0 BROAD CRESTED WEIR

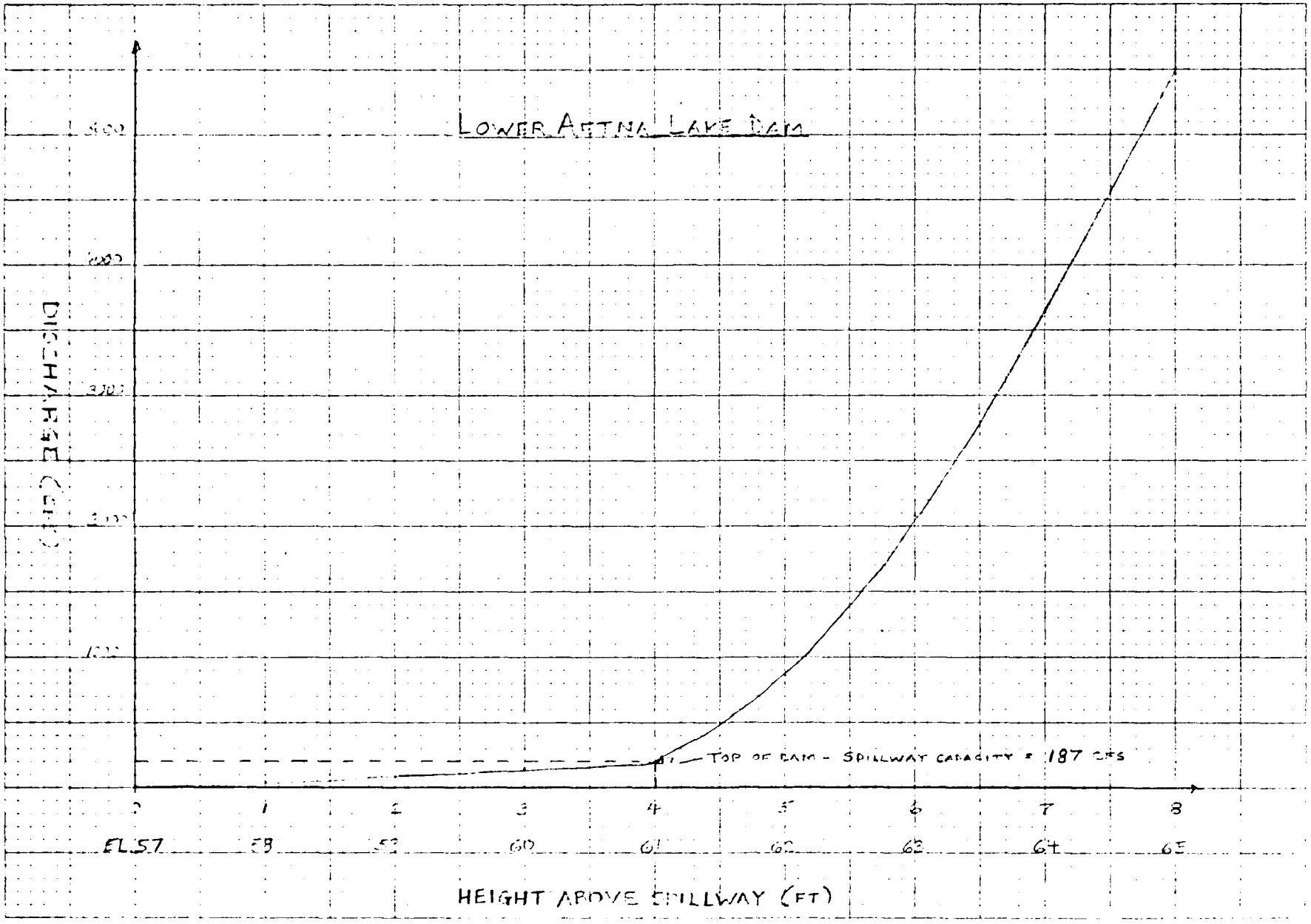
$Q = CLH^{3/2}$ where $L = 240'$ $C = 2.7$

BY ___ DATE 12/13/79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A6 OF ___

CHKD. BY ___ DATE ___ LOWER ALTA LAKE DAM PROJECT C246

SUBJECT SPILLWAY CALCULATIONS (cont'd)

	OUTLET # 2				OUTLET # 1				FLOW OVER DAM				TOTAL
ELEV.	H	C	L	Q	H	C	L	Q	H	C	L	Q	
	WEIR FLOW												
57			5.4										
58	1	"	"	18	1	3.3	4.5	14					32
59	2	"	"	49	2	"	"	41					90
59.3	2.3	"	"	60	2.3	"	"	51					111
	ORIFICE FLOW												
60	1.85	.62		80	1.85	.62		70					150
61	2.85	.62		100	2.85	.62		87					187
									PROJECTION				
62	3.85	"		116	3.85	"		101	1	27	240	648	865
63	4.85	"		130	4.85	"		113	2	"	"	1832	2075
64	5.85	"		143	5.85	"		125	3	"	"	3361	3629
65	6.85	"		155	6.85	"		135	4	"	"	5194	5474
66	7.85	"		162	7.85	"		144	5	"	"	7245	7555


LOWER AETNA LAKE DAM
DISCHARGE (CFS)
TOP OF DAM - SPILLWAY CAPACITY = 187 CFS
0
1
2
3
4
5
6
7
8
EL 57
58
59
60
61
62
63
64
65
HEIGHT ABOVE SPILLWAY (FT)

BY ____ DATE 12/12/79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A-8 OF ____

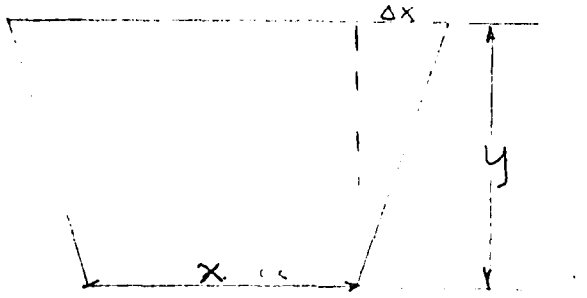
CHKD. BY ____ DATE ____ LOWER AETNA LAKE PROJECT C246

SUBJECT RESERVOIR STAGE - CAPACITY CURVE

AREA OF LAKE AT EL 57.0 = 17.6 AC.

AREA OF LAKE AT EL. 65 = 24.11 AC.

AREA 65' CONTOUR - PLANIMETERED FROM USGS - 30.3 AC



FROM 57 - 60; $\Delta Y = \frac{2.17}{2}$

FROM 60 - 65 $\Delta Y = \frac{1.23}{2}$

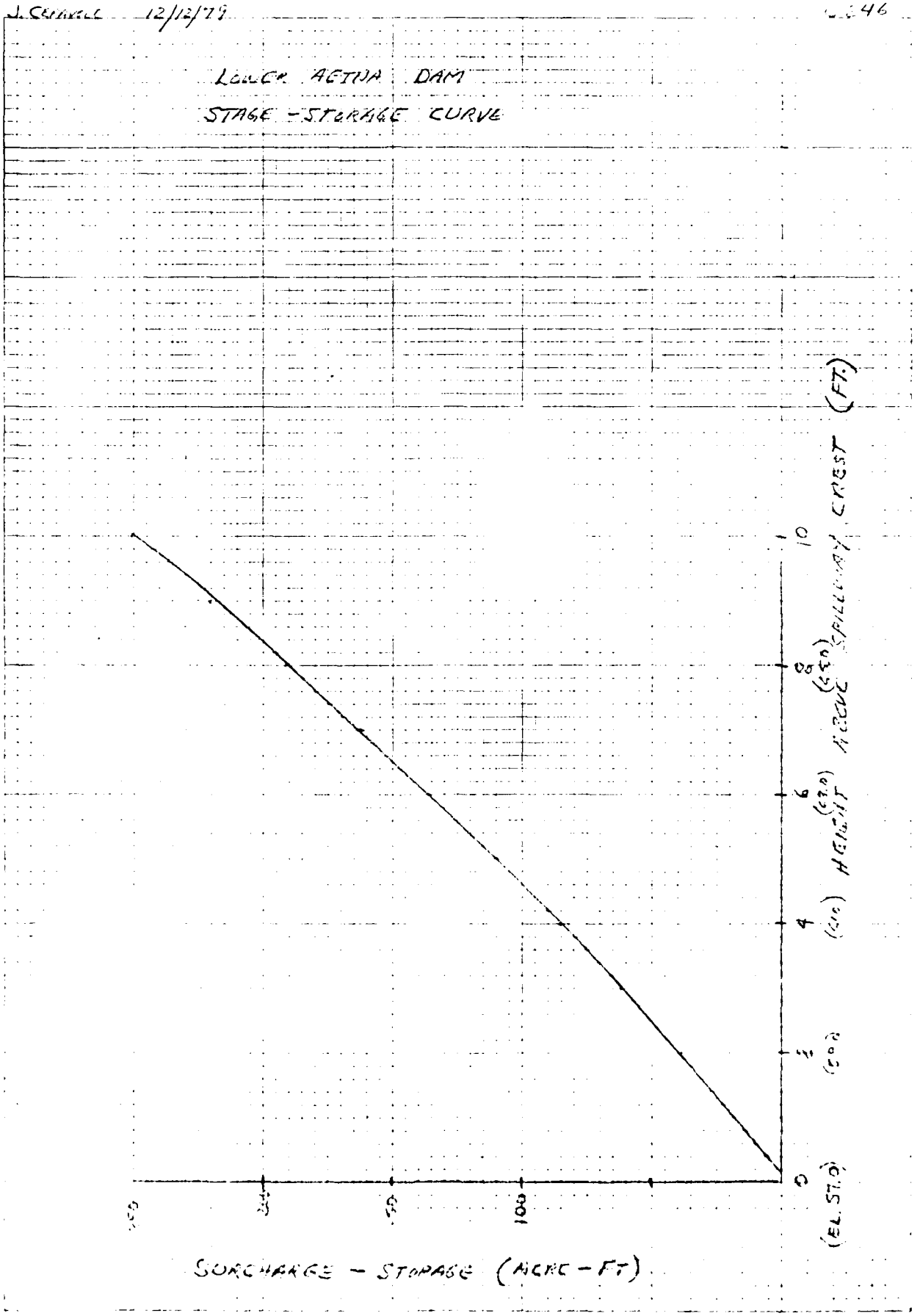
INCREMENT IN VOL $\Delta V = (X + \Delta X) \times Y$

EL.	INCREMENT ABOVE EL. 57.0	ΔY	$(X + \Delta X)$	SURCHARGE STORAGE
57.0			17.6	0
58.0	1	1.08	18.7	19
59.0	2	1.08	19.8	40
60.0	3	1.08	20.8	62
61.0	4	0.62	21.4	86
62	5	0.62	22.0	110
63	6	"	22.7	136
64	7	"	23.3	163
65	8	"	23.9	191
66	9	"	24.5	221
67	10	"	25.1	252

J. Schaaf 12/12/79

LOWER ACTINA DAM

STAGE - STORAGE CURVE



BY. TJC DATE 12/13/79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A-10 OF

CHKD. BY DATE Lower Acosta Dam PROJECT C-20

SUBJECT Simplified Drawdown

1. Normal Pool Storage = 100 Ac-Ft. (Plate)
2. Dam Crest = 1141 ft. Top of Gate = 57.0 — Spillway Crest
3. Assume interpolation of 10 ft./cm. = 6 cfs
4. Assume Boards to Elevation:
5. Outlet #2 — 51.3 & Outlet #1 — 53.00 & Utilize Full Culvert Flow
6. Culvert #2 Size — 3.7' h x 5.2' w; Culvert #1 Size — 4' H x 4.5'
7. Determine Avg. Rate of Drawdown Outflow
   Use Hydraulic Charts for the selection of Appropriate Culverts
   Plot Curve of Head vs. Discharge; Result: Final Outflow
   Out #2 Assume Avg. Head Between Crest 51.3 = 5.7/2 = 2.85'
   Out #1 Assume Avg Head Between 51.0 & 53.00 = 3.45/2 = 1.7'
   For Final Drawdown, Include Tailwater Effect (Use Inlet Control)
   Out #2 Avg. = 2.8'; Culvert #1 Avg. = 1.7'
   Hydraulic Capacity = 7 cfs/ea
   3 Culverts = 75 cfs; Tailwater 7 x 7 x 3.5 ft = 106 cfs
8. Final Outflow Rate = 106 - 6 = 100 cfs
9. 1 ac-ft/100 ft = 4,356,000 sq. ft.
10. Drawdown = 4,356,000 / 100 / 3600 = 12.1 Hours

BY L.B. DATE

CHKD. BY DATE

SUBJECT UPPER STOKES DAM

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A11 OF

MEDFORD LAKES DAM INSPECTION

PROJECT G-4446

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MEDFORD LAKES DAM INSPECTION - STOKES, STOCKWELL, UPPER& LOWER AETNA LAKES
BY L. BAINES
MARCH, 1980

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
150	0	15	0	0	0	0	0	0	0

JOPER	NRT
3	0

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SUB-AREA RUNOFF COMPUTATION

INFLOW TO STOKES LAKE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	0	0	1

HYDROGRAPH DATA

TRDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	1.55	0.00	1.55	0.00	0.000	0	0	0

PRECIP DATA

NP	STORM	DAD	DAR
24	0.00	0.00	0.00

PRECIP PATTERN

0.06	0.06	0.06	0.06	0.07	0.07	0.08	0.09	0.09	0.09
0.11	0.11	0.30	0.70	1.70	0.40	0.40	0.20	0.16	0.14
0.07	0.06	0.06	0.06						

LOSS DATA

STRKR	ELTKR	RTIOL	ERAIN	STRTS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.30	0.00	1.00	0.00	0.00	1.00	0.50	0.10	0.00	0.00

GIVEN UNIT GRAPH, NUHOG= 11

225	705	1039	791	473	297	179	105	65	39
25									

UNIT GRAPH TOTALS 4022. CFS OR 1.01 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	CONF 0
1	0.06	0.00	0.
2	0.06	0.00	0.
3	0.06	0.00	0.
4	0.06	0.00	0.
5	0.07	0.00	0.
6	0.07	0.00	0.
7	0.08	0.00	0.
8	0.09	0.04	8.
9	0.09	0.07	43.
10	0.09	0.07	103.
11	0.11	0.09	166.

BY L.B. DATE

CHKD. BY DATE

SUBJECT UPPER STOKES DAM

LOUIS BERGER & ASSOCIATES INC.

MEDFORD LAKES DAM INSPECTION

SHEET NO. A12 OF

PROJECT C-246

12	0.11	0.06	222.
13	0.20	0.17	310
14	0.70	0.67	560.
15	1.70	1.67	1335
16	0.40	0.38	2404.
17	0.40	0.38	2836
18	0.20	0.18	2481.
19	0.16	0.13	1914
20	0.14	0.12	1445
21	0.07	0.04	1060
22	0.04	0.03	763.
23	0.04	0.03	537.
24	0.04	0.03	379.
25	0.00	0.00	270.
26	0.00	0.00	164
27	0.00	0.00	100.
28	0.00	0.00	55.
29	0.00	0.00	31
30	0.00	0.00	17
31	0.00	0.00	8.
32	0.00	0.00	5.
33	0.00	0.00	2.
34	0.00	0.00	1.
35	0.00	0.00	0.
36	0.00	0.00	0
37	0.00	0.00	0
38	0.00	0.00	0.
39	0.00	0.00	0
40	0.00	0.00	0.
41	0.00	0.00	0
42	0.00	0.00	0
43	0.00	0.00	0
44	0.00	0.00	0
45	0.00	0.00	0
46	0.00	0.00	0
47	0.00	0.00	0
48	0.00	0.00	0
49	0.00	0.00	0
50	0.00	0.00	0
51	0.00	0.00	0
52	0.00	0.00	0
53	0.00	0.00	0
54	0.00	0.00	0
55	0.00	0.00	0
56	0.00	0.00	0
57	0.00	0.00	0
58	0.00	0.00	0
59	0.00	0.00	0
60	0.00	0.00	0
61	0.00	0.00	0
62	0.00	0.00	0
63	0.00	0.00	0
64	0.00	0.00	0
65	0.00	0.00	0
66	0.00	0.00	0
67	0.00	0.00	0
68	0.00	0.00	0
69	0.00	0.00	0
70	0.00	0.00	0
71	0.00	0.00	0
72	0.00	0.00	0
73	0.00	0.00	0
74	0.00	0.00	0
75	0.00	0.00	0
76	0.00	0.00	0
77	0.00	0.00	0.

78	0.00	0.00	0.
79	0.00	0.00	0
80	0.00	0.00	0
81	0.00	0.00	0
82	0.00	0.00	0
83	0.00	0.00	0
84	0.00	0.00	0.
85	0.00	0.00	0
86	0.00	0.00	0
87	0.00	0.00	0
88	0.00	0.00	0
89	0.00	0.00	0
90	0.00	0.00	0
91	0.00	0.00	0
92	0.00	0.00	0
93	0.00	0.00	0
94	0.00	0.00	0
95	0.00	0.00	0
96	0.00	0.00	0
97	0.00	0.00	0
98	0.00	0.00	0.
99	0.00	0.00	0.
100	0.00	0.00	0
101	0.00	0.00	0.
102	0.00	0.00	0.
103	0.00	0.00	0.
104	0.00	0.00	0.
105	0.00	0.00	0.
106	0.00	0.00	0
107	0.00	0.00	0
108	0.00	0.00	0
109	0.00	0.00	0
110	0.00	0.00	0
111	0.00	0.00	0
112	0.00	0.00	0
113	0.00	0.00	0
114	0.00	0.00	0
115	0.00	0.00	0
116	0.00	0.00	0
117	0.00	0.00	0
118	0.00	0.00	0
119	0.00	0.00	0
120	0.00	0.00	0
121	0.00	0.00	0
122	0.00	0.00	0
123	0.00	0.00	0
124	0.00	0.00	0
125	0.00	0.00	0
126	0.00	0.00	0
127	0.00	0.00	0
128	0.00	0.00	0
129	0.00	0.00	0
130	0.00	0.00	0
131	0.00	0.00	0
132	0.00	0.00	0
133	0.00	0.00	0
134	0.00	0.00	0
135	0.00	0.00	0
136	0.00	0.00	0
137	0.00	0.00	0
138	0.00	0.00	0
139	0.00	0.00	0
140	0.00	0.00	0.
141	0.00	0.00	0.
142	0.00	0.00	0.
143	0.00	0.00	0.

144	0.00	0.00	0
145	0.00	0.00	0
146	0.00	0.00	0
147	0.00	0.00	0
148	0.00	0.00	0
149	0.00	0.00	0
150	0.00	0.00	0
SUM	5.00	4.27	17239

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2634.	718.	1.0	115.	17239.
INCHES		4.31	4.31	4.31	4.31
ACRE-FT		214.	356.	356.	356.

HYDROGRAPH ROUTING

ROUTING THROUGH STOKES LAKE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
0	1	0	0	0	0	1

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.000	0.00	1	0

NSTPS	NSTDL	LAG	AMSKK	X	TSI	STORA
1	0	0	0.000	0.000	0.000	0.

STORAGE=	0	9.	18.	31	46	63.	82.	103	126.	152.
OUTFLOW=	0	16	57	769	2059	3724	5635	7923	10397.	13079

TIME	EOP STOR	AVG IN	EOP OUT
1	0	0.	0
2	0	0.	0
3	0	0.	0
4	0	0.	0
5	0	0.	0
6	0	0.	0
7	0	0.	0
8	0	4.	0
9	1.	26.	1
10	2	73.	4
11	5.	135.	9
12	8	194.	18
13	13	269.	38
14	20	445.	131
15	31	957.	741
16	43	1669.	1795.
17	58	2620	2667.
18	52	2658.	2654
19	47	2140.	2195
20	42.	1679.	1701
21	37.	1282.	1279.
22	33	963	973
23	30	750	759
24	26	598	592
25	24	525	519
26	22	417	423
27	20	322	328
28	18	277	282
29	16	245	248
30	15	218	221
31	17.	13.	51.

BY L.B. DATE

CHKD. BY DATE

SUBJECT UPPER STOKES DAM

LOUIS BERGER & ASSOCIATES INC.

MEDFORD LAKES DAM INSPECTION

SHEET NO. 114 OF

PROJECT C-4446

32	16.	6.	47		96	1	0	2.
33	15.	3.	44		97	1	0	2.
34	14	2	40		100	1	0	2.
35	13	0.	37		101	1	0.	2.
36	12.	0.	34		102	1.	0	2.
37	12.	0.	31		103	1.	0.	1
38	11	0.	28		104	1.	0.	1.
39	11	0.	26		105	1	0.	1.
40	10	0.	24		106	1.	0.	1.
41	10	0	22		107	1.	0.	1.
42	9	0.	21.		108	1	0.	1
43	9	0.	19		109	1	0	1
44	8.	0.	17		110	1.	0.	1.
45	8.	0.	16.		111	1	0	1
46	8	0.	15.		112	1	0.	1
47	7.	0.	15.		113	0	0	1
48	7.	0.	14.		114	0	0.	1
49	7.	0	14		115	0	0	1
50	6	0.	13.		116	0	0	1
51	6.	0.	12.		117	0	0	1
52	6.	0.	12.		118	0	0	1
53	6	0.	11.		119	0	0	1
54	5.	0.	11.		120	0	0	1
55	5	0.	11		121	0	0	1
56	5	0.	10.		122	0	0	1
57	5.	0.	10.		123	0	0.	1
58	5.	0.	9.		124	0	0	1
59	4.	0.	9		125	0	0.	1
60	4	0	9		126	0	0	1
61	4.	0.	8.		127	0	0	1
62	4.	0.	8		128	0	0	1.
63	4.	0.	8		129	0	0.	0.
64	4.	0.	7		130	0	0.	0.
65	3.	0.	7		131	0	0.	0
66	3	0.	7.		132	0	0.	0
67	3.	0	6		133	0	0	0
68	3.	0.	6		134	0.	0.	0
69	3	0	6		135	0	0	0
70	3	0	6		136	0.	0	0.
71	3	0	5		137	0	0	0
72	3.	0	5		138	0.	0.	0
73	3.	0	5		139	0.	0	0
74	2	0	5		140	0	0	0
75	2.	0	5		141	0.	0	0
76	2	0	4		142	0	0.	0
77	2.	0	4		143	0.	0	0
78	2	0	4		144	0.	0	0
79	2.	0.	4		145	0	0	0
80	2	0.	4		146	0	0.	0
81	2.	0	4		147	0.	0	0
82	2	0	3		148	0	0	0
83	2	0	3		149	0	0	0
84	2	0	3.		150	0	0	0
85	2	0	3					
86	1	0	3		SUM			17234
87	1	0.	3					

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2652	693	179	115	17234
INCHES		4.16	4.30	4.31	4.31
AC-FT		344	356	356	356

88	1.	0.	3					
89	1.	0.	3					
90	1.	0	2.					
91	1	0	2.					
92	1	0	2.					
93	1	0	2.					
94	1	0.	2.					
95	1	0	2.					
96	1	0	2.					
97	1	0.	2.					

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SUB-AREA RUNOFF COMPUTATION

INFLOW TO LAKE STOCKWELL

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
2	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	3.50	0.00	3.50	0.00	0.000	0	0	0

PRECIP DATA

NP	STORM	DAD	DAK
24	0.00	0.00	0.00

PRECIP PATTERN

0.05	0.06	0.06	0.06	0.07	0.07	0.08	0.09	0.09	0.09
0.11	0.11	0.30	0.70	1.70	0.40	0.40	0.20	0.16	0.14
0.07	0.06	0.06	0.06						

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.00	0.00	1.00	0.00	0.00	1.00	0.50	0.10	0.00	0.00

GIVEN UNIT GRAPH, NUMGG= 19

116.	436.	916.	1293.	1408.	1253.	984.	709.	534.	402.
296.	210.	157.	117.	88.	65.	48.	37.	25.	

UNIT GRAPH TOTALS 9100. CFS OR 1.01 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.06	0.00	0.
2	0.06	0.00	0.
3	0.06	0.00	0.
4	0.06	0.00	0.
5	0.07	0.00	0.
6	0.07	0.00	0.
7	0.06	0.00	0.
8	0.09	0.04	4.
9	0.09	0.07	23.
10	0.09	0.07	69.
11	0.11	0.08	144.
12	0.11	0.08	241.
13	0.30	0.27	368.
14	0.70	0.67	594.
15	1.70	1.67	1141.
16	0.40	0.38	2103.
17	0.40	0.38	3286.
18	0.20	0.18	4203.
19	0.16	0.13	4552.
20	0.14	0.12	4317.
21	0.07	0.04	3764.
22	0.06	0.03	3111.
23	0.06	0.03	2548.
24	0.06	0.03	2048.
25	0.00	0.00	1624.
26	0.00	0.00	1267.
27	0.00	0.00	979.
28	0.00	0.00	749.
29	0.00	0.00	564.
30	0.00	0.00	418.
31	0.00	0.00	307.
32	0.00	0.00	223.
33	0.00	0.00	150.
34	0.00	0.00	79.
35	0.00	0.00	51.

36	0.00	0.00	30.
37	0.00	0.00	19.
38	0.00	0.00	12.
39	0.00	0.00	6.
40	0.00	0.00	4
41	0.00	0.00	2.
42	0.00	0.00	1.
43	0.00	0.00	0.
44	0.00	0.00	0
45	0.00	0.00	0.
46	0.00	0.00	0.
47	0.00	0.00	0.
48	0.00	0.00	0.
49	0.00	0.00	0.
50	0.00	0.00	0.
51	0.00	0.00	0.
52	0.00	0.00	0.
53	0.00	0.00	0.
54	0.00	0.00	0.
55	0.00	0.00	0.
56	0.00	0.00	0.
57	0.00	0.00	0.
58	0.00	0.00	0.
59	0.00	0.00	0.
60	0.00	0.00	0.
61	0.00	0.00	0.
62	0.00	0.00	0.
63	0.00	0.00	0.
64	0.00	0.00	0.
65	0.00	0.00	0.
66	0.00	0.00	0.
67	0.00	0.00	0.
68	0.00	0.00	0.
69	0.00	0.00	0.
70	0.00	0.00	0.
71	0.00	0.00	0.
72	0.00	0.00	0.
73	0.00	0.00	0.
74	0.00	0.00	0.
75	0.00	0.00	0.
76	0.00	0.00	0.
77	0.00	0.00	0.
78	0.00	0.00	0.
79	0.00	0.00	0
80	0.00	0.00	0
81	0.00	0.00	0.
82	0.00	0.00	0.
83	0.00	0.00	0.
84	0.00	0.00	0
85	0.00	0.00	0
86	0.00	0.00	0
87	0.00	0.00	0
88	0.00	0.00	0
89	0.00	0.00	0
90	0.00	0.00	0
91	0.00	0.00	0
92	0.00	0.00	0
93	0.00	0.00	0
94	0.00	0.00	0
95	0.00	0.00	0
96	0.00	0.00	0
97	0.00	0.00	0
98	0.00	0.00	0.
99	0.00	0.00	0
100	0.00	0.00	0
101	0.00	0.00	0.

102	0.00	0.00	0.
103	0.00	0.00	0.
104	0.00	0.00	0.
105	0.00	0.00	0.
106	0.00	0.00	0.
107	0.00	0.00	0.
108	0.00	0.00	0.
109	0.00	0.00	0.
110	0.00	0.00	0.
111	0.00	0.00	0.
112	0.00	0.00	0.
113	0.00	0.00	0.
114	0.00	0.00	0.
115	0.00	0.00	0.
116	0.00	0.00	0.
117	0.00	0.00	0.
118	0.00	0.00	0.
119	0.00	0.00	0
120	0.00	0.00	0.
121	0.00	0.00	0.
122	0.00	0.00	0.
123	0.00	0.00	0.
124	0.00	0.00	0.
125	0.00	0.00	0.
126	0.00	0.00	0.
127	0.00	0.00	0.
128	0.00	0.00	0.
129	0.00	0.00	0.
130	0.00	0.00	0.
131	0.00	0.00	0.
132	0.00	0.00	0.
133	0.00	0.00	0.
134	0.00	0.00	0.
135	0.00	0.00	0.
136	0.00	0.00	0.
137	0.00	0.00	0
138	0.00	0.00	0.
139	0.00	0.00	0.
140	0.00	0.00	0.
141	0.00	0.00	0.
142	0.00	0.00	0
143	0.00	0.00	0.
144	0.00	0.00	0.
145	0.00	0.00	0.
146	0.00	0.00	0.
147	0.00	0.00	0.
148	0.00	0.00	0.
149	0.00	0.00	0.
150	0.00	0.00	0.
SUM	5.20	4.27	39001.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4552	1616	406	260	39004
INCHES		4.29	4.32	4.32	4.32
AC-FT		802	806	806	806

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COMBINE HYDROGRAPHS

COMBINE ROUTED HYD STOKES DAM & INFLOW HYD. TO STOCKTE

ICTW	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
22	2	0	0	0	0	1

SUM OF 2 HYDROGRAPHS AT 22

0	0.	0	0	0	0.	0.	4.	24.	73.
154	154	405	775	1683.	3890.	5893.	6862.	6747.	6018
5043	4044	3279	2571.	2003	1530.	1147.	852.	623.	472.
356	271	143	120	98	65.	51.	40.	33.	28.
24	21	19	17	16	15	15	14.	14.	13.
12	12	11	11	11	10	10.	9.	9.	9.
8	8	8	7	7	7	6	6	6.	6
5	5	5	5	5	4.	4.	4.	4.	4.
4	4	3	3	3	3.	3.	3	3.	2.
2	2	2	2	2.	2.	2.	2.	2.	2.
2	2	1	1	1	1	1.	1.	1.	1.
1	1	1.	1.	1	1.	1.	1.	1.	1.
1	1	1.	1	1	1.	1.	1.	0.	0.
0	0	0.	0	0	0	0.	0.	0.	0.
0	0.	0.	0	0	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6862	2307.	595	375.	56237.
INCHES		4.25	4.31	4.32	4.32
AC-FT		1144	1162.	1163	1163.
**********		**********	**********	**********	**********

HYDROGRAPH ROUTING

ROUTING THROUGH LAKE STOCKWELL -

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
222	1	0	0	0	0	1

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.000	0.00	1	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.000	0.000	0.000	0.

STORAGE=	0.	28	66.	115	173.	242.	320.	409.	508	0
OUTFLOW=	0	49.	206	515	1429.	2857.	4638.	6541.	8867.	0

TIME	END STOR	AVG IN	END OUT
1	0	0.	0.
2	0	0.	0
3	0	0.	0
4	0	0.	0
5	0	0.	0.
6	0	0.	0
7	0	0.	0.
8	0	2.	0
9	0	14.	1.
10	1	49.	2.
11	4	113	6.
12	9	206.	13
13	14	332.	23.
14	26	500	45.
15	51	1329	144.
16	165	3350.	450
17	364	4995.	1157.
18	204	6377.	3359.
19	282	6904.	4672.
20	351	6863.	5291.
21	335.	5530	5111.
22	340	4543	5076.

23	316	3642.	4552.
24	289.	2905.	3923
25	261.	2337.	3299
26	236.	1766.	2725.
27	212.	1338	2236
28	191.	1008.	1809
29	172.	738.	1426.
30	157	548.	1180.
31	144	415.	968.
32	132	314.	784
33	122	232.	630
34	114	157.	507.
35	106.	104	458.
36	99	76	411.
37	92.	58.	363.
38	85	45.	329.
39	80.	37	293
40	75	30	261
41	70.	26.	232
42	66	23.	206.
43	62	20	191.
44	59	18.	177
45	56	17.	164
46	53.	16.	152.
47	50.	15.	140
48	48.	14.	130
49	45	14.	121
50	43.	13.	112.
51	41	13	104.
52	39.	12.	96.
53	38.	12.	89.
54	36.	11.	83.
55	35.	11.	77.
56	33.	10	72.
57	32.	10.	66.
58	31	10.	62.
59	30.	9.	58.
60	29	9.	54.
61	28	8.	50.
62	27	8.	48.
63	27	8.	46.
64	26	7	45.
65	25	7.	44.
66	24.	7.	42.
67	24	7.	41
68	23	6	40
69	22	6	39.
70	21	6.	38
71	21	6	36.
72	20	5	35
73	20	5.	34
74	19	5	33
75	18	5	32
76	18	5	31
77	17	4	30
78	17	4	29
79	16	4	28
80	16	4	28
81	15	4	27
82	15	4	26
83	14	3	25
84	14	3	24
85	13	3	24
86	13	3	23
87	12	3	22
88	12	3	21

BY L.B. DATE ______ **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A20 OF ______

CHKD. BY ______ DATE ______ MEDFORD LAKES DAM INSPECTION PROJECT C-246

SUBJECT LAKE STOCKWELL DAM

89	12	3.	21
90	11	3	20
91	11	2.	19
92	11	2	19
93	10	2	18
94	10	2.	18
95	10	2.	17.
96	9	2.	17.
97	9	2	16
98	9	2	16
99	9	2	15
100	8	2.	15.
101	8	2.	14.
102	8	2.	14.
103	8	1.	13.
104	7	1.	13.
105	7	1.	12
106	7	1	12.
107	7.	1.	12.
108	6	1	11
109	6	1.	11
110	6	1.	11
111	6	1	10
112	6	1.	10
113	5	1.	10
114	5	1.	9.
115	5	1.	9
116	5	1.	9.
117	5.	1.	8.
118	5	1	8
119	5	1.	8
120	4	1.	8
121	4	1.	7.
122	4	1	7.
123	4	1.	7.
124	4	1	7.
125	4	1.	6.
126	4	1.	6.
127	3.	1.	6
128	3	1.	6
129	3	1	6
130	3	0	5
131	3.	0	5
132	3	0	5
133	3.	0	5.
134	3	0	5
135	3	0	5
136	3	0	5
137	2.	0	4
138	2	0	4
139	2	0	4
140	2	0	4
141	2	0	4
142	2	0	4
143	2	0	4
144	2.	0	3
145	2	0	3
146	2	0	3
147	2	0.	3
148	2	0	3
149	2.	0	3.
150	2.	0	3.
	[illegible]		50161

	PEAK	6-HOUR	24-HOUR	32-HOUR	TOTAL VOLUME
	5378.	2157	582.	374	50161.
INCHES		3.[illegible]	4.2[illegible]	4.31	4.31
AC-FT		10[illegible]	1155	1161	1161

BY L. B. DATE

CHKD. BY DATE

SUBJECT UPPER AETNA LAKE

LOUIS BERGER & ASSOCIATES INC.

MEDFORD LAKES DAM INSPECTION

SHEET NO. A-21 OF

PROJECT C-240

SUB-AREA RUNOFF COMPUTATION

INFLOW TO UPPER AETNA LAKE - FROM STOKES AT STOKES

ISTAT	ICOMP	ITEST	ITAPE	JPLT	JPRT	INAME
3	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	0.46	0.00	0.46	0.00	0.000	0	0	0

PRECIP DATA

HR	STORM	DWJ	DAA
24	0.00	0.00	0.00

PRECIP PATTERN

0.03	0.06	0.06	0.06	0.07	0.07	0.08	0.09	0.09	0.09
0.11	0.11	0.30	0.70	1.70	0.40	0.40	0.20	0.14	0.14
0.07	0.06	0.06	0.06						

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRTL	RTIOR	STRTL	CNSTL	ALSMX	RTIMP
0.00	0.03	1.00	0.00	0.50	1.00	0.50	0.10	0.00	0.00

GIVEN UNIT GRAPH, NUHG= 9

87.	293	325	219	124	71	40	24	13

UNIT GRAPH TOTALS 1192. CFS OR 1.00 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

END-OF-PERIOD FLOW

TIME	PRAIN	EXCS	COMP Q
1	0.02	0.00	0.
2	0.06	0.00	0.
3	0.06	0.00	0.
4	0.06	0.00	0.
5	0.07	0.00	0.
6	0.07	0.00	0.
7	0.08	0.04	0.
8	0.09	0.04	3.
9	0.09	0.07	14.
10	0.09	0.07	36.
11	0.11	0.08	55.
12	0.11	0.08	72.
13	0.20	0.27	101.
14	0.70	0.67	199.
15	1.70	1.67	470.
16	0.40	0.39	823.
17	0.40	0.38	874.
18	0.20	0.19	717.
19	0.14	0.13	531.
20	0.14	0.12	387.
21	0.07	0.04	271.
22	0.06	0.03	177.
23	0.06	0.03	123.
24	0.06	0.03	79.
25	0.00	0.00	57.
26	0.00	0.00	37.
27	0.00	0.00	21.

BY L.B. DATE

CHKD. BY DATE

SUBJECT UPPER AETNA LAKE

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. 122 OF

MEDFORD LAKES DAM INSPECTION PROJECT

28	0.00	0.00	11
29	0.00	0.00	5
30	0.00	0.00	3
31	0.00	0.00	1
32	0.00	0.00	0
33	0.00	0.00	0
34	0.00	0.00	0
35	0.00	0.00	0
36	0.00	0.00	0
37	0.00	0.00	0
38	0.00	0.00	0
39	0.00	0.00	0
40	0.00	0.00	0
41	0.00	0.00	0
42	0.00	0.00	0
43	0.00	0.00	0
44	0.00	0.00	0
45	0.00	0.00	0
46	0.00	0.00	0
47	0.00	0.00	0
48	0.00	0.00	0
49	0.00	0.00	0
50	0.00	0.00	0
51	0.00	0.00	0
52	0.00	0.00	0
53	0.00	0.00	0
54	0.00	0.00	0
55	0.00	0.00	0
56	0.00	0.00	0
57	0.00	0.00	0
58	0.00	0.00	0
59	0.00	0.00	0
60	0.00	0.00	0
61	0.00	0.00	0
62	0.00	0.00	0
63	0.00	0.00	0
64	0.00	0.00	0
65	0.00	0.00	0
66	0.00	0.00	0
67	0.00	0.00	0
68	0.00	0.00	0
69	0.00	0.00	0
70	0.00	0.00	0
71	0.00	0.00	0
72	0.00	0.00	0
73	0.00	0.00	0
74	0.00	0.00	0
75	0.00	0.00	0
76	0.00	0.00	0
77	0.00	0.00	0
78	0.00	0.00	0
79	0.00	0.00	0
80	0.00	0.00	0
81	0.00	0.00	0
82	0.00	0.00	0
83	0.00	0.00	0
84	0.00	0.00	0
85	0.00	0.00	0
86	0.00	0.00	0
87	0.00	0.00	0
88	0.00	0.00	0
89	0.00	0.00	0
90	0.00	0.00	0
91	0.00	0.00	0
92	0.00	0.00	0
93	0.00	0.00	0

BY LJB DATE

CHKD. BY DATE

SUBJECT UPPER AETNA LAKE

LOUIS BERGER & ASSOCIATES INC.

MEREDITH LAKES DAM INSPECTION

SHEET NO. A23 OF

PROJECT C-246

94	0.00	0.00	0	
95	0.00	0.00	0	
96	0.00	0.00	0	
97	0.00	0.00	0	
98	0.00	0.00	0	
99	0.00	0.00	0	
100	0.00	0.00	0	
101	0.00	0.00	0	
102	0.00	0.00	0	
103	0.00	0.00	0	
104	0.00	0.00	0	
105	0.00	0.00	0	
106	0.00	0.00	0	
107	0.00	0.00	0	
108	0.00	0.00	0	
109	0.00	0.00	0	
110	0.00	0.00	0	
111	0.00	0.00	0	
112	0.00	0.00	0	
113	0.00	0.00	0	
114	0.00	0.00	0	
115	0.00	0.00	0	
116	0.00	0.00	0	
117	0.00	0.00	0	
118	0.00	0.00	0	
119	0.00	0.00	0	
120	0.00	0.00	0	
121	0.00	0.00	0	
122	0.00	0.00	0	
123	0.00	0.00	0	
124	0.00	0.00	0	
125	0.00	0.00	0	
126	0.00	0.00	0	
127	0.00	0.00	0	
128	0.00	0.00	0	
129	0.00	0.00	0	
130	0.00	0.00	0	
131	0.00	0.00	0	
132	0.00	0.00	0	
133	0.00	0.00	0	
134	0.00	0.00	0	
135	0.00	0.00	0	
136	0.00	0.00	0	
137	0.00	0.00	0	
138	0.00	0.00	0	
139	0.00	0.00	0	
140	0.00	0.00	0	
141	0.00	0.00	0	
142	0.00	0.00	0	
143	0.00	0.00	0	
144	0.00	0.00	0	
145	0.00	0.00	0	
146	0.00	0.00	0	
147	0.00	0.00	0	
148	0.00	0.00	0	
149	0.00	0.00	0	
150	0.00	0.00	0	
	5.10	4.27	5107	

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	893	233	57	34	5107
INCHES		4.70	4.70	4.70	4.30
PCNT		100	100	100	100

COMBINE HYDROGRAPHS

COMBINE ROUTED HYDROGRAPH STOCKWELL DAM & INFLOW HYD T

ISTMO	ICOMP	ICOUN	ITAPE	JPLT	JPRT	INAME
33	1	0	0	0	0	1

SUM OF 2 HYDROGRAPHS AT 33

0	0	0	0	0	0	0	3	17	39.
82	82	126	244	614	1373	2535.	4076	5208	5678.
5057	5071	4620	4103	3256	2761	2257	1811	1431.	1183.
962	774	670	587	459	411	368.	329.	293	261.
203	201	191	177	164	152	140	130.	121.	112.
104	97	84	83	77	72	66	62.	58.	54.
50	49	46	45	44	42	41	40.	39.	38.
30	29	24	27	32	31	30.	29.	28.	28.
27	26	25	24.	24	23.	22.	21.	21	20.
19	18	16	16	17	17	16.	16.	15.	15
14	14	13	13.	12	12	12.	11.	11.	11.
12	11	10	9.	9	9	8.	8.	8.	8.
7	7	7	7.	6	6	6.	6.	6.	5.
5	5	5	5.	5	5.	4.	4.	4.	4.
4	4	4	3.	3	3.	3.	3.	3.	3.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5678	2544	699	408.	61270
INCHES		2.94	4.29	4.31	4.31
AC-FT		1163	1960.	1207.	1267.

HYDROGRAPH ROUTING

ROUTING THROUGH UPPER AETNA LAKE

ISTMO	ICOMP	ICOUN	ITAPE	JPLT	JPRT	INAME
333	1	0	0	0	0	1

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.3	0.000	0.00	1	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.000	0.000	0.000	0.

STORAGE=	0	27.	60.	109.	147.	201.	262.	329.	404.	485.
OUTFLOW=	0	105.	305.	1194.	2523.	4254.	6275.	8548.	11047.	13753.

TIME	EOP STOR	AVG IN.	EOP OUT
1	0	0.	0.
2	0	0.	0.
3	0	0.	0.
4	0	0.	0.
5	0	0.	0.
6	0	0.	0.
7	0	0.	0.
8	0	2.	0.
9	0	10.	1.
10	1	23.	3.
11	2	50.	7.
12	3	73.	11.
13	5	105.	17.

BY L.B. DATE

CHKD. BY DATE

SUBJECT UPPER AETNA LAKE DAM

LOUIS BERGER & ASSOCIATES INC.

MEDFORD LAKES DAM INSPECTION

SHEET NO. A25 OF

PROJECT G-2776

15	76	413.	62	81	12.	27.	44
16	53	344.	144	82	12	26.	46
17	67.	1904.	452	83	12	25.	45
18	114	3303.	1566	84	11.	25.	43
19	162.	4642.	3012.	85	11	24	42
20	200	5443.	4222.	86	10	23.	40.
21	222	5668.	4750	87	10	22.	39.
22	230	5464.	5014.	88	10	22.	38.
23	226.	4975.	5043.	89	9.	21	36.
24	215.	4341.	4718.	90	9	20	35
25	199	3679	4186	91	9	20.	34
26	181	3059.	3625.	92	8	19	33
27	164	2503	3070.	93	8	19	32
28	148.	2074	2554.	94	8	18.	31
29	133.	1721.	2130	95	8.	17.	30
30	120.	1397.	1753.	96	7	17.	29
31	109.	1075.	1449	97	7.	16	26
32	100.	876.	1191	98	7.	16.	27
33	92	707	1010	99	7	15.	26
34	84	568.	845.	100	6	15	25
35	78	463	710.	101	6	14.	24
36	74	435.	607.	102	6	14	23.
37	70	390.	526.	103	6.	13	23
38	67	348	459	104	6	13	22
39	64.	311.	404.	105	5	13.	21
40	62.	277.	356.	106	5	12.	20
41	60.	246.	315.	107	5.	12.	20
42	59	219.	297.	108	5	11.	19
43	57	199	285	109	5.	11.	19
44	55	184	273.	110	5	11.	18
45	53.	170.	261.	111	4.	10.	17
46	51	158.	249.	112	4.	10.	17
47	49	146.	237	113	4	10.	16
48	47	135.	225	114	4.	9.	16
49	45	125.	213	115	4.	9	15
50	43.	116.	202	116	4	9.	15
51	41	108	191.	117	4.	9.	14
52	39	100.	180	118	4	8	14
53	38	93.	170	119	3.	8.	13
54	36	86	160	120	3.	8	13
55	35	80	150	121	3.	8	13
56	33	74	141	122	3	7	12
57	32	69.	133.	123	3	7	12
58	30	64.	125.	124	3.	7	11
59	29	60.	117.	125	3.	7.	11
60	28	56	110	126	3.	6.	11
61	27	52.	104	127	3.	6	10
62	26	49	98	128	3	6	10
63	25	47.	95.	129	2	6.	10
64	24	46.	92	130	2	6	9
65	23.	44	88.	131	2	5.	9
66	22	43	84	132	2	5	9
67	21	42.	81	133	2	5	8
68	20	41	78	134	2	5	8
69	19	39	75	135	2	5	8
70	19	38	72	136	2	5	8
71	18	37	69	137	2	4.	7
72	17	36	67	138	2	4	7
73	17	35	64	139	2	4	7
74	16	34	62	140	2	4	7
75	15	33	60	141	2	4	6
76	15	32	58	142	2	4	6
77	14	31	56	143	2	4	6
78	14	30	54	144	2	4	6
79	13	29	52	145	1	3	5
80	13	28	50	146	1.	3.	5

BY L.B. DATE

CHKD. BY DATE

SUBJECT UPPER AETNA LAKE

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A26 OF

PROJECT C-246

MEDFORD LAKES DAM INSPECTION

147	1.	3.	5.	
148	1.	3.	5.	
149	1.	3.	5.	
150	1.	3	5.	
SUM			61211	

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5216	2255.	633.	406.	61211
INCHES		3.61	4.27	4.31	4.31
AC-FT		1119.	1256.	1265.	1265.

********** ********** ********** ********** **********

BY L.B. DATE ____ **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 27 OF ____

CHKD. BY ____ DATE ____ MEDFORD LAKES DAM INSPECTION PROJECT G-246

SUBJECT LOWER AETNA LAKE

SUB-AREA RUNOFF COMPUTATION

INFLOW TO LOWER AETNA LAKE - (NOT FROM STOKES, STOCKWELL

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
4	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	0.48	0.00	0.48	0.00	0.000	0	0	0

PRECIP DATA

	HR	STORM	DAD	DAR
	24	0.00	0.00	0.00

PRECIP PATTERN

0.06	0.06	0.06	0.06	0.07	0.07	0.08	0.09	0.09	0.09
0.11	0.11	0.30	0.70	1.70	0.40	0.40	0.20	0.16	0.14
0.07	0.06	0.06	0.06						

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.00	0.00	1.00	0.00	0.00	1.00	0.50	0.10	0.00	0.00

GIVEN UNIT GRAPH, NUHGO= 7

304.	510.	245.	109.	46.	20.	9.

UNIT GRAPH TOTALS 1243. CFS OR 1.00 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.06	0.00	0.
2	0.06	0.00	0.
3	0.06	0.00	0.
4	0.06	0.00	0.
5	0.07	0.00	0.
6	0.07	0.00	0.
7	0.08	0.00	0.
8	0.09	0.04	11.
9	0.09	0.07	30.
10	0.09	0.07	62.
11	0.11	0.08	79.
12	0.11	0.08	94.
13	0.30	0.27	159.
14	0.70	0.67	380.
15	1.70	1.67	936.
16	0.40	0.38	1170.
17	0.40	0.38	804.
18	0.20	0.18	556.
19	0.16	0.13	356.

LOUIS BERGER & ASSOCIATES INC.

20	0.14	0.12	244.
21	0.07	0.04	164.
22	0.06	0.03	95.
23	0.06	0.03	65.
24	0.06	0.03	52.
25	0.00	0.00	36.
26	0.00	0.00	16.
27	0.00	0.00	7.
28	0.00	0.00	3.
29	0.00	0.00	1.
30	0.00	0.00	0.
31	0.00	0.00	0.
32	0.00	0.00	0.
33	0.00	0.00	0.
34	0.00	0.00	0.
35	0.00	0.00	0.
36	0.00	0.00	0.
37	0.00	0.00	0.
38	0.00	0.00	0.
39	0.00	0.00	0.
40	0.00	0.00	0.
41	0.00	0.00	0.
42	0.00	0.00	0.
43	0.00	0.00	0.
44	0.00	0.00	0.
45	0.00	0.00	0.
46	0.00	0.00	0.
47	0.00	0.00	0.
48	0.00	0.00	0.
49	0.00	0.00	0.
50	0.00	0.00	0
51	0.00	0.00	0.
52	0.00	0.00	0.
53	0.00	0.00	0.
54	0.00	0.00	0.
55	0.00	0.00	0.
56	0.00	0.00	0.
57	0.00	0.00	0.
58	0.00	0.00	0.
59	0.00	0.00	0.
60	0.00	0.00	0.
61	0.00	0.00	0.
62	0.00	0.00	0
63	0.00	0.00	0
64	0.00	0.00	0.
65	0.00	0.00	0
66	0.00	0.00	0.
67	0.00	0.00	0
68	0.00	0.00	0.
69	0.00	0.00	0
70	0.00	0.00	0
71	0.00	0.00	0
72	0.00	0.00	0.
73	0.00	0.00	0
74	0.00	0.00	0.
75	0.00	0.00	0
76	0.00	0.00	0.
77	0.00	0.00	0
78	0.00	0.00	0.
79	0.00	0.00	0
80	0.00	0.00	0
81	0.00	0.00	0
82	0.00	0.00	0
83	0.00	0.00	0
84	0.00	0.00	0
85	0.00	0.00	0
86	0.00	0.00	0
87	0.00	0.00	0
88	0.00	0.00	0.
89	0.00	0.00	0
90	0.00	0.00	0
91	0.00	0.00	0.
92	0.00	0.00	0.
93	0.00	0.00	0
94	0.00	0.00	0.
95	0.00	0.00	0
96	0.00	0.00	0
97	0.00	0.00	0
98	0.00	0.00	0.
99	0.00	0.00	0
100	0.00	0.00	0.
101	0.00	0.00	0
102	0.00	0.00	0
103	0.00	0.00	0.
104	0.00	0.00	0
105	0.00	0.00	0.
106	0.00	0.00	0
107	0.00	0.00	0
108	0.00	0.00	0
109	0.00	0.00	0.
110	0.00	0.00	0.
111	0.00	0.00	0.
112	0.00	0.00	0
113	0.00	0.00	0
114	0.00	0.00	0.
115	0.00	0.00	0.
116	0.00	0.00	0.
117	0.00	0.00	0
118	0.00	0.00	0.
119	0.00	0.00	0.
120	0.00	0.00	0.
121	0.00	0.00	0.
122	0.00	0.00	0.
123	0.00	0.00	0.
124	0.00	0.00	0.
125	0.00	0.00	0.
126	0.00	0.00	0.
127	0.00	0.00	0.
128	0.00	0.00	0.
129	0.00	0.00	0.
130	0.00	0.00	0.
131	0.00	0.00	0
132	0.00	0.00	0
133	0.00	0.00	0
134	0.00	0.00	0
135	0.00	0.00	0
136	0.00	0.00	0
137	0.00	0.00	0
138	0.00	0.00	0
139	0.00	0.00	0
140	0.00	0.00	0.
141	0.00	0.00	0.
142	0.00	0.00	0.
143	0.00	0.00	0
144	0.00	0.00	0
145	0.00	0.00	0
146	0.00	0.00	0
147	0.00	0.00	0
148	0.00	0.00	0
149	0.00	0.00	0
150	0.00	0.00	0

LOUIS BERGER & ASSOCIATES INC.

SUM 5.20 4 27 5328.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1170	222.	55	30.	5328.
INCHES		4 30	4 30	4 30	4 30
AC-FT		110	110	110.	110

COMBINE HYDROGRAPHS

COMBINE ROUTED HYDROGRAPH UPPER AETNA DAM & INFLOW H/D.

ISTAG	ICOMP	IECON	ITYPE	JPLT	JPRT	INAME
44	2	0	0	0	0	1

SUM OF 2 HYDROGRAPHS AT 44

0	0	0	0	0.	0.	0.	11.	39	65
85	106	178	412	993.	1314.	1256.	2142.	3363	4426
5123	5211	5156	4761	4222	3641.	3078.	2557.	2131.	1758
1443	1171	1010	845	710	607	526.	459.	404	356
315	277	255	223	201.	249.	237.	225.	213	202
191	180	170	160.	150.	141.	133.	125.	117.	110
104	99	95	92.	83	84.	81.	76	75	72.
69	67	64.	62.	60	58	56.	54.	52	50
48	46	45	43	42	40	39	38.	36.	35.
34	33	32	31.	30	29	28	27	26	25
24	23	23	22	21	20	20	19	19	18
17.	17	16.	16	15	15	14.	14	13.	13
13	12	12	11.	11	11.	10	10	10	9
9	9	8.	8.	8	8	7.	7.	7.	7.
6	6	6	6.	6.	5	5.	5.	5	5

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5311	2430	688	444	66930
INCHES		3 76	4 27	4 31	4 31
AC-FT		1201.	1365	1375	1375.

HYDROGRAPH ROUTING

ROUTING THROUGH LOWER AETNA LAKE

ISTAG	ICOMP	IECON	ITYPE	JPLT	JPRT	INAME
444	1	0	0	0	0	1

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0 000	0 00	1	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA
1	0	0	0 220	0 000	0.000	0.

STORAGE=	0	19.	40.	62	86	110.	136	163	191	221
OUTFLOW=	0	32	90	150	127	865	2075	3635	5474	7551

TIME	EOP STOR	HYD IN	EOP OUT
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0

BY L.B. DATE

CHKD. BY DATE

SUBJECT LOWER METINA LAKE

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. 30 OF

MEDFORD LAKES DAM INSPECTION

PROJECT C-2149

7	0	0.	0
8	0	6.	0.
9	1.	35.	1.
10	2.	52.	3.
11	3.	75.	5.
12	5	96.	8.
13	6	142.	13.
14	13.	295.	23.
15	27.	705.	55.
16	49.	1156.	115.
17	73.	1285.	167.
18	100	1699.	589.
19	132	2755.	1875.
20	156.	3917.	3371.
21	176.	4794.	4500
22	185.	5217.	5080.
23	187.	5235.	5205.
24	184.	4960.	5007.
25	178.	4492.	4590.
26	169.	3931.	4058
27	161.	3359.	3503.
28	152	2817.	2990.
29	143	2344.	2507.
30	136.	1944.	2086
31	129.	1604.	1771.
32	123	1320.	1478.
33	118.	1100.	1233.
34	114.	928.	1035.
35	110.	777.	868.
36	107.	658.	772.
37	103.	566.	679.
38	100.	493.	595
39	98	432.	521.
40	96	380.	457.
41	94.	336.	403.
42	92.	306.	359.
43	91.	291.	323.
44	90	279.	306.
45	90	267.	289.
46	89.	255.	274
47	89.	243.	260
48	88	231.	247
49	88	219.	234
50	87.	208.	222.
51	87.	196.	210
52	86	185.	199.
53	86	175.	188.
54	86	165.	178
55	85	155.	185
56	84	146.	184.
57	83.	137.	183.
58	82	129	181
59	81	121	179
60	80	114	177
61	78	107.	175.
62	77	102	173.
63	75	97	170
64	74	94	168
65	72	90	165
66	70	86	163
67	69	83.	160
68	67	80	158
69	65	77.	155
70	64	74	153
71	62	71	150
72	60	68	146.
73	59.	66.	141
74	57	63.	137
75	56	61.	133.
76	54	59	129.
77	53	57.	125.
78	51	55.	121.
79	50	53.	117.
80	49	51.	114.
81	47	49.	110.
82	46	47	107.
83	45	46.	103.
84	44	44	100.
85	43.	42.	97.
86	41	41	94
87	40	40.	91.
88	39.	38.	88.
89	38	37.	85
90	37.	36.	82
91	36	34.	80
92	35.	33.	77.
93	34.	32.	75.
94	34	31.	72.
95	33.	30	70
96	32	29.	68.
97	31.	28.	65.
98	30.	27.	63.
99	30.	26.	61.
100	29.	25.	59.
101	28	25	57.
102	28.	24.	55.
103	27	23.	54
104	26	22.	52.
105	26	22.	50.
106	25	21.	49.
107	24	20.	47.
108	24	19	46.
109	23.	19.	44.
110	23.	18.	43
111	22	18	41
112	22	17	40
113	21	17.	39
114	21	16	37
115	20	15	36
116	20	15.	35
117	20	14.	34
118	19	14	33
119	19	14	32
120	18	13.	31
121	18	13.	31.
122	18	12.	30.
123	17	12	29.
124	17	12	29
125	17	11	28
126	16	11	27
127	16	10.	27.
128	16	10	26.
129	15	10	26
130	15	9	25
131	15	9	25
132	14	9	24
133	14	9	24
134	14	8	23
135	13	9	23
136	13	8	22
137	13	8	22
132	12	7	21

LOUIS BERGER & ASSOCIATES INC.

MASTER'S CLASS DAM INSPECTION

	139	12.	7.	21.
	140	12.	7.	20.
	141	12.	7.	20.
	142	11.	6.	19.
	143	11.	6.	19.
	144	11.	6.	18.
	145	11.	6.	18.
	146	10.	6.	17.
	147	10.	5.	17.
	148	10.	5.	17.
	149	10.	5.	16.
	150	9.	5.	16.
	SUM			66098.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5205.	2299.	677.	441.	66088.
INCHES		3.57	4.21	4.28	4.28
AC-FT		1141.	1344.	1366.	1366.

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RUNOFF SUMMARY, AVERAGE FLOW

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	1	2876.	718.	180.	115.	1.55
ROUTED TO	0	2659.	693.	179.	115.	1.55
HYDROGRAPH AT	2	4956.	1616.	406.	260.	3.50
2 COMBINED	22	6662.	2307.	585.	375.	5.05
ROUTED TO	222	5378.	2157.	582.	374.	5.05
HYDROGRAPH AT	3	676.	213.	53.	34.	0.46
2 COMBINED	33	5673.	2344.	635.	408.	5.51
ROUTED TO	333	5216.	2255.	633.	408.	5.51
HYDROGRAPH AT	4	1170.	232.	55.	36.	0.48
2 COMBINED	44	5311.	2420.	689.	444.	5.99
ROUTED TO	444	5205.	2299.	677.	441.	5.99